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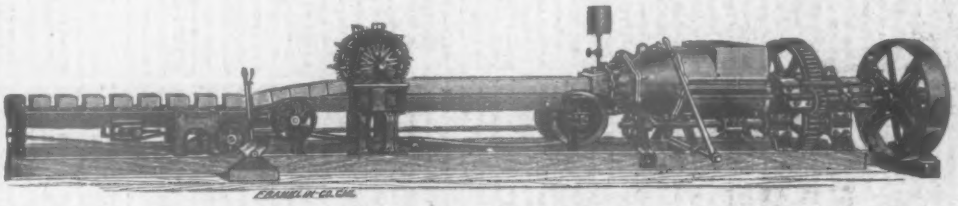

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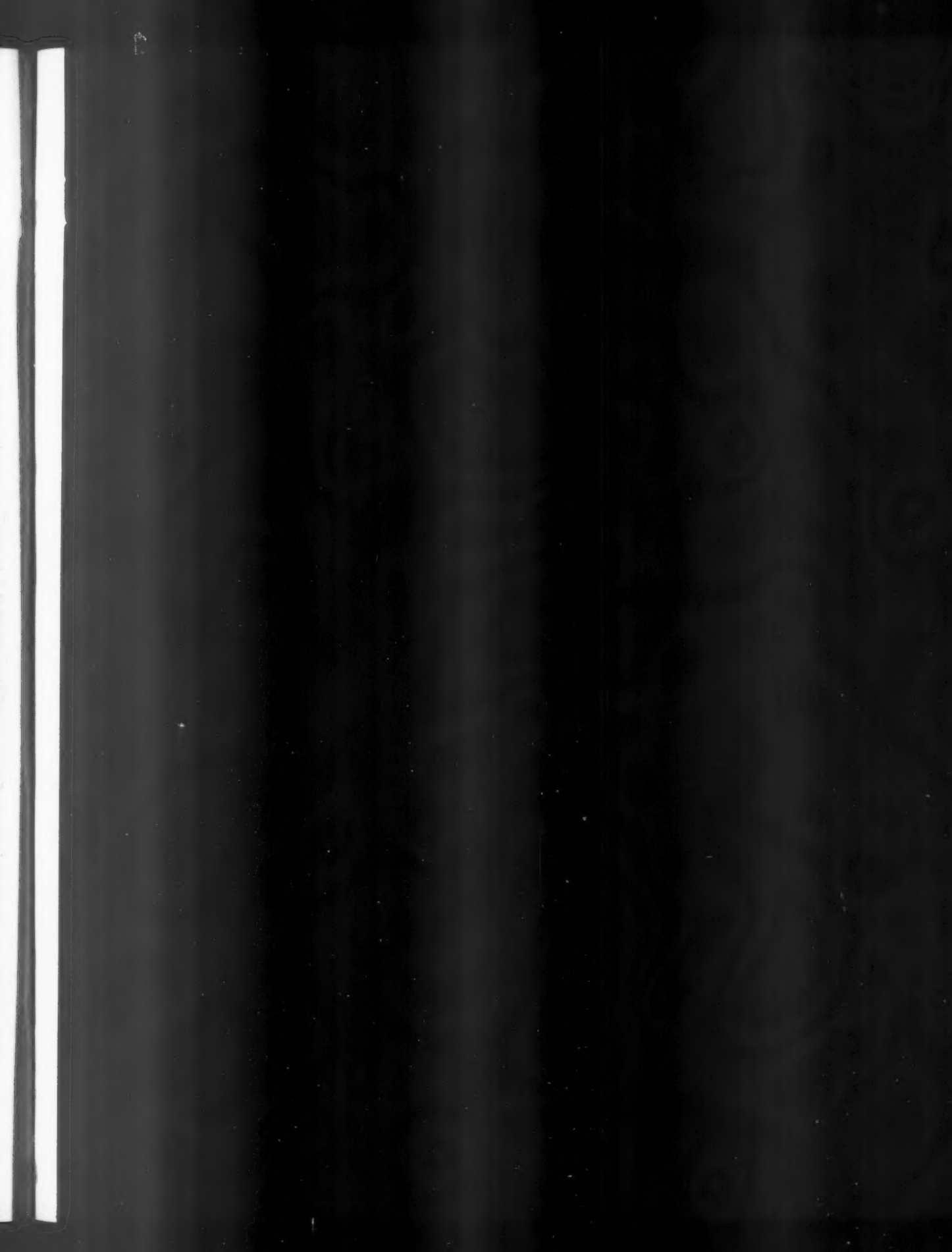


Paving and Municipal Engineering

VOLUME IX. SEPTEMBER, EIGHTEEN NINETY-FIVE. NUMBER 3.

PAVING BRICK TESTS AND A PROPOSED METHOD OF DRAWING SPECIFICATIONS.

By L. C. Sabin, Assoc. M. Am. Soc. C. E.

THE use of brick for paving purposes is now so popular and widespread, it may seem strange that not only have no standard tests been adopted, but that such a lack of uniformity exists in the practice of city engineers in testing paving brick. When it is considered, however, that but a few years have been required to bring brick paving to its present popularity, this absence of standard methods of testing is readily explained and excused.

Recently several writers have described the methods of testing which have seemed to them to give the best idea of the quality of the brick and some of the societies of engineers and of brickmakers have taken steps toward establishing standard tests.

The object of the present article is not to make any suggestions concerning the method of making the tests, but to call attention to the representation of the results on paper, and to suggest a method of specifying the requirements for two of the more important tests.

In an article appearing in the April number of PAVING AND MUNICIPAL ENGINEERING, Mr. James W. Reed gives the results of careful tests made by him at Ithaca, N. Y., and suggests a method by which the results obtained with different bricks may be made comparable. Prof. J. B. Johnson, M. Am. Soc. C. E., in an article on "Standard Tests of Paving Brick," in *Engineering News*, of April 18, 1895, also suggests a method of giving the proper weight to each test, in order to arrive at the comparative value of individual bricks. The recommendations of Mr. Reed and Prof. Johnson are given below in juxtapositon; in each case the charac-

teristic number for a given brick is the sum of the quantities obtained by the indicated operations:

Test.	Mr. Reed.	Prof. Johnson.
Crushing Strength,	Pounds per square inch, divided by 4,000.	Pounds per square inch, divided by 4,000.
Transverse Strength,	Modulus of rupture, pounds per sq. in. divided by 1,000.	Center load per in. of width of brick divided by 1,000.
Absorption,	10 divided by 3 times the per cent. absorbed by weight.	3 minus the per cent. absorbed by weight.
Abrasion,	100 times the abrasion of trap rock, divided by 8 tin.es the abrasion of the brick.	25 minus the per cent. loss of weight.
Specific Gravity,	Absolute specific gravity.	Not considered.

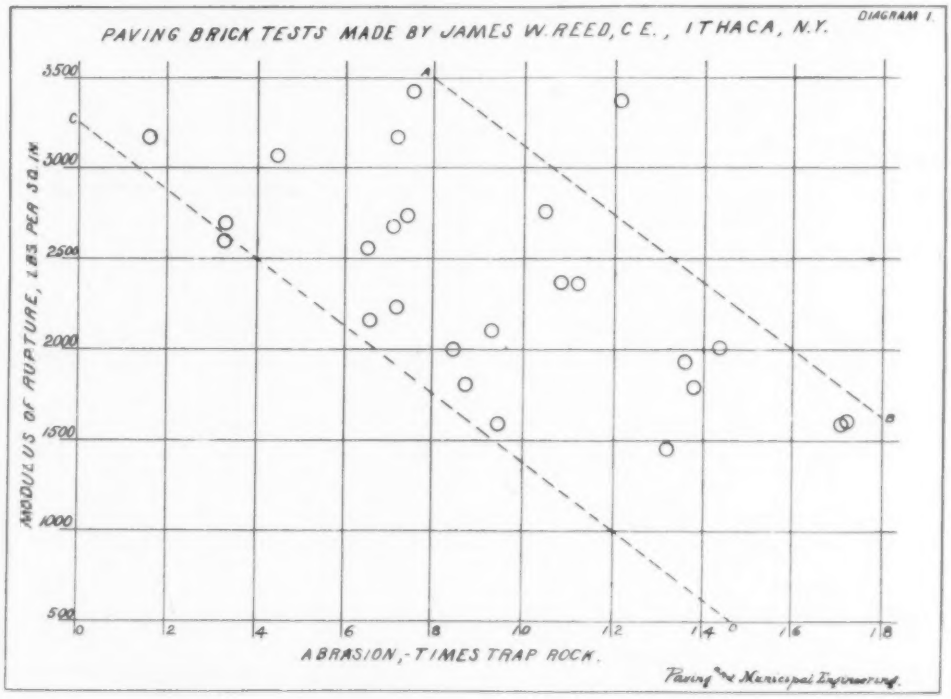
It is seen that the two writers treat the result of the crushing test in the same manner, but differ in their treatment of all the other tests. Prof. Johnson recommends that the transverse test be made by "setting the brick on knife edges, 7 inches apart, and loading at the center by a rounded knife edge until it breaks." The center load per inch of width (thickness) of the brick is then used by Prof. Johnson to represent the strength, rather than the more common "modulus of rupture." The reasons advanced for this change are, that the deeper (wider) brick is given its proper advantage, by using the center load per inch of width, and that the modulus of rupture is "understood only by scientific men." As to the first reason, it would seem that the deeper brick should be given its advantage in some other way, as is done with other materials of engineering, and it is not thought by the present writer that it devolves upon the engineer to use only such methods in his calculations as are understood by non-scientific men. In the treatment of the absorption and abrasion tests, Mr. Reed uses the reciprocals of the percentages, while Prof. Johnson subtracts the percentages from given constants.

It is very difficult to obtain accurate and comparable results in the crushing test. A testing machine of sufficient power to crush a whole brick is not usually available in the smaller cities where large quantities of paving brick are used. Considerable labor is necessary in any case to reduce the bearing surfaces to true planes, and if a small testing machine must be used, the cutting of small cubes of brick is a laborious, as well as a delicate, operation. Fortunately, however, the crushing test is not an indispensible one, since

a paving brick is never subjected in use to a load approaching its ultimate crushing strength, and a knowledge of this strength is only of value as indicating other and more important qualities.

The absorption test is easily made, but the range of the percentage of absorption is relatively so small that it would appear that this quality might well be regulated by setting a maximum limit for the per cent. absorbed by weight, as is commonly done.

We come now to what are considered the most important tests

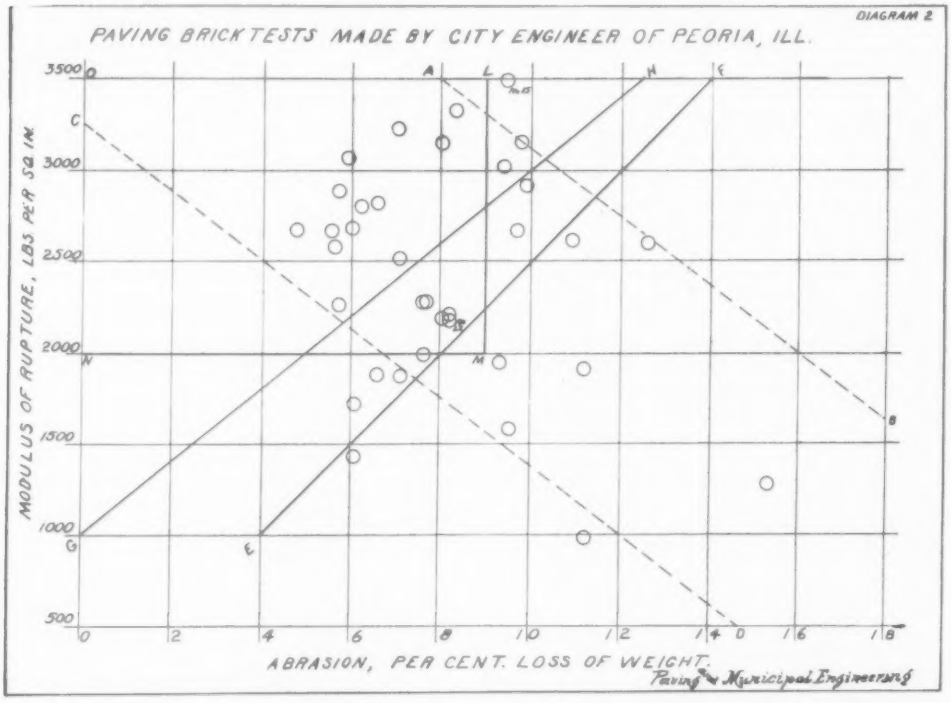


of paving brick, namely, the transverse strength and the percentage of loss of weight by impact or abrasion. The transverse test is of value as indicating the ability of the brick to bridge over inequalities in a solid foundation, or to distribute the load over a yielding foundation, as of sand. The impact or abrasive test is generally conceded to give a fairly good idea of the ability of the brick to withstand such wear as that to which it will be subjected in the pavement.

In the accompanying diagrams are platted the results of three

series of tests as to transverse strength and abrasion. The abscisses are proportional to the loss of weight by abrasion or impact and the ordinates represent the modulus of rupture in pounds per square inch, so that each circle represents the results obtained with a single brick; or, in the case of diagram No. 3, the mean results of two or more bricks of the same manufacture.

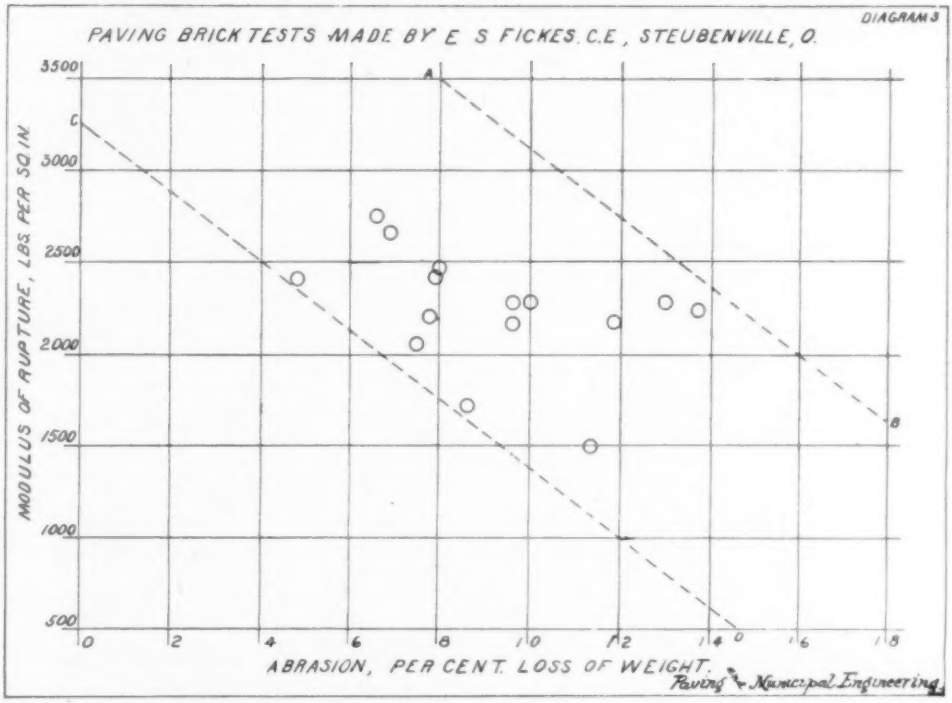
Diagram No. 1 gives the results obtained by Mr. Reed which have been referred to above. In making the transverse tests the



bricks were placed edgewise on knife edges 6 inches apart and the load applied through a third knife edge at the center of the span. "For the abrasion test cubes were cut from each brick, measuring about 2½ inches on each side, and of very nearly the same weight. Each cube was carefully weighed, and four of them, together with twelve one-inch steel cubes, were put in a tumbler, consisting of a cylinder of iron, 12 inches long and 6 inches in diameter, which revolved about a horizontal shaft 47½ times per minute. After fifteen minutes they were taken out, reweighed and replaced, and

allowed to tumble for an hour, when they were again taken out and reweighed. Only the amount abraded during the second tumbling was used in determining the abrasion."

Diagram No. 2 represents the tests made by the city engineer of Peoria, Ill., and published in *Engineering News* of April 18, 1895. The abrasion tests in this case were made in a foundry rattler 2 feet in diameter and 4 feet long, revolving at the rate of fifteen revolutions per minute for one hour. No more than twelve bricks were



placed in the rattler at one time with 300 pounds of scrap iron, consisting of smoothly worn pieces varying from one pound to five pounds in weight.

In diagram No. 3 the results obtained by Mr. E. S. Fickes, of Steubenville, O., are represented. In making the transverse tests the bricks were laid flat on knife edges 6 inches apart, and the load applied at the center by a third knife edge. "To secure an even bearing at least ⅛ inch of pasteboard was placed between each knife edge and the brick." The abrasion tests were made by plac-

ing from six to thirteen bricks in an iron foundry rattler, 20 inches in diameter and 32 inches long, running thirty-four revolutions per minute and containing about 150 pounds of stars weighing less than an ounce each." The tumbling lasted one hour and the loss of weight was expressed as the percentage of the whole weight.

From an inspection of the diagrams it appears that, in a general way, a brick which suffers but little loss of weight in the rattler will give a high transverse strength. To make this clearer the dotted lines A B and C D are drawn on all the diagrams in the same relative positions and it is seen that nearly all the results are found between these two lines.

A common method of specifying the requirements concerning the two tests, transverse strength and abrasion, is to say that the brick shall have a modulus of rupture of at least so many pounds (say 2,000), and shall not suffer a greater loss of weight under a specified treatment in the rattler than such a percentage (say nine). Such a requirement would cut from the diagram a rectangle such as L M N O in diagram No. 2; bricks whose results fall within this rectangle would be accepted while those below, or to the right of it, would be rejected. There seems to be little doubt that in diagram No. 2, brick No. 15, having a modulus of rupture of about 3,500 pounds and a loss of weight of 9.45 per cent. in the impact test, is preferable to brick No. 22, which has a modulus of rupture of but 2,200 pounds and suffers a loss of weight in the rattler of 8.2 per cent.; yet the former would be to the right of the assumed rectangle, and hence rejected, while the latter would be accepted since it falls within the rectangle.

If, instead of specifying definite limits for the results of these two tests, it be prescribed that the modulus of rupture shall not be less than a quantity expressed as a function of the loss of weight in the impact tests then the division line becomes a diagonal. Thus, if it be required that the modulus of rupture shall be 250 times the loss of weight by abrasion, E F becomes the division line between accepted and rejected brick, or if the modulus must be 200 times the loss of weight by abrasion, plus 1,000 pounds, G H is obtained. The proper co-efficient and constant to be used will depend upon the method of making the abrasion test and can only be determined after the standard test has been adopted. It is only the

method that is here submitted for consideration as being at once simple and efficient.

HOW THE STREETS OF NEW YORK ARE CLEANED.

By Fred A. Kummer, C. E.

THE streets of New York have been, up to a comparatively recent date, almost unexcelled in their filthiness, and even with the efficient means now adopted by the street-cleaning department for their cleansing, the results are not all that might be desired.

One of the results most apparent since Col. George E. Waring, Jr., has been at the head of the street-cleaning department, is the demonstration of the fact that clean streets are a possibility, a fact which, under misrule, certainly needed demonstration. The garbage, and other refuse of all sorts, that was formerly allowed to collect in the gutters and streets, and the far from ornamental ash barrel, overflowing in its exuberance of dirt and refuse, making the condition of the city a most unsanitary one, have largely become things of the past. The department has, however, been greatly hampered in its work by political restrictions, the result of long years of ring bossism, which, in so many cities, hangs like a great millstone around the neck of good government.

In a statement to the board of estimate and apportionment, made last May, Col. Waring demonstrates that as long as he is required to pay laborers $2.30 per day the streets of New York can not be properly cleaned without leaving a large deficit each year, in amount equaling half a million dollars. Neither this fact, however, nor the ridiculous agitation raised by the Grand Army of the Republic, recommending Col. Waring's removal from office, has prevented all thinking people from recognizing the value of his work, not only to the city, but to the country at large.

The methods by which the hundreds of miles of streets in New York are relieved of snow, after a great snow-storm, is an indication of the magnitude of the work which sometimes confronts the street-cleaning department. Many inches of snow, covering the

thoroughfares of the city, must be removed before the traffic of the principal business streets, at least, can resume its normal condition. At these times the number of men employed, directly or indirectly, by the department is nearly doubled. All night long the piling up and carting away of the snow progresses, and thousands of cart-loads are shoveled up and dumped into the river. The carts used, sometimes numbering over a thousand, are obtained when needed, from contractors who employ gangs of men, and furnish them with tools, etc., the contractors being paid and not the individual men. The snow comes so suddenly, that all arrangemests for removing it must be made hurriedly. A map of the city is kept by the department, upon which the streets from which snow is to be removed immediately are marked in red, those which are to be left until the last being marked in blue.

To give some idea of the quantity of snow to be removed, it may be noted that during one of the numerous storms which have taxed the capacity of the street-cleaning department, over 115 loads of snow were removed from a single short block on lower Broadway, that between Worth and Leonard streets.

At all times of the year there is a certain amount of refuse from each house which is placed upon the sidewalk in barrels or cans, for a certain time extending over a short period before and after the passing of the garbage or ash collecting carts. They are not allowed to remain beyond this time, however. All the streets are cleaned once each day, however, and many of them as often as three times. There are about 2,300 men employed by the department, and about 700 horses and carts in use each day.

There are department stables at various points throughout the city and from these the men are paid, it being impossible to gather them at any one point for this purpose. The increasing of the number of these stables is one of the reforms proposed by Col. Waring, which, he estimates, will result in a saving of $75,000 a year on account of time saved by men in going to and from the pay stations. The refuse removed includes garbage, old rags, old clothes, tin cans, paper, and dirt of various other kinds. So effectually has this work been accomplished that certain streets whose normal condition, under the old regime, was one of almost continual filth, have been so transformed as to be scarcely recognizable.

This is particularly noticeable in the case of certain streets on the East side, where the change has been most radical.

Col. Waring indicates some of his plans for improved methods in conducting the street-cleaning department, in a recent letter to John Jeroloman, Esq., president of the board of aldermen, in which he refers to the proposed establishment of section stations, which are needed for storing the tools of the sweepers, assembling them for roll call, for payment, etc. There is to be one of these for about each fourteen miles of street; roughly, one for each fifty sweepers. Some stations are at the present department stables. Aside from these, thirty-two others are needed.

"The imperative reason for having these stations in the interest of discipline," Col. Waring says, "is that when we do not have them the men have to become tenants, by courtesy, of the liquor saloons, which seems to be the only alternative for a station supplied by the city for its own men."

A vast amount of refuse is collected during the process of sweeping the streets. The dirt of various sorts, including manure and large quantities of fine dust, is swept into little piles by the sweepers, and these are subsequently shoveled into carts and removed to the various dumping points along the river front. Here all garbage carts and ash carts are emptied, their contents being dumped into troughs leading to the large Delehanty dumping scows drawn up at the wharf. These latter are towed out into the neighborhood of Sandy Hook, and their contents emptied into the sea. Owing to the way in which much of the garbage thus disposed of is washed upon the shores of New Jersey and Long Island, numerous complaints against the practice have been made, and, indeed, this is not surprising, since the method is at best a most unsatisfactory way of disposing of garbage.

It will be of interest to note some of the rules and regulations which outline the duties of the men, employed by the department, and are contained in a little book, with which each new member of the street-cleaning force is presented, upon the acceptance of his application. Some of them are as follows:

Sweepers must, when at work, wear the uniform and badges [which is a metal plate containing a number] prescribed by the department.

Each sweeper must clean, and by continually going over it during working hours, keep clean, all that part of the streets assigned to him. Sweepers must provide themselves with oil-skin suits similar to the samples shown at the stables, to be worn in stormy or cold weather. Uniform overcoats of the prescribed pattern may be worn in winter.

When two or more men are working together, each one will be held equally responsible for the condition of the streets which they are assigned to clean.

The men employed by the department are young and athletic. While on ordinary duty, they are uniformed in white duck suits, with white visor caps. They are required to pass a physical examination before they are accepted. This consists of a determination of their weight, height, color of eyes and hair. The applicant, if accepted, is then placed under the charge of a foreman, who is a veteran street-cleaner, and knows all the ins and outs of the work. These foremen have been promoted from positions as sweepers, and are thus well qualified to train new men. In this way, too, there is an incentive to the men to do good work, since the chance for promotion is always before them. One great advantage of the foreman is that he is able, by keeping close watch on the men under him, to secure the performance of a maximun amount of work.

The men go to work at 6 A. M. and work until 5 P. M. They are divided into sections, each under the care of a foreman. A section comprises about a dozen sweepers, and several carts and drivers; and a section of the city, say twelve blocks north and south, and extending several blocks in width, is assigned to a section of sweepers.

In this connection, it is of interest to note that much of the rubbish collected by the street-sweepers is of value. In 1894, the city received over $1,600 per week for the privilege of "trimming" the dumping scows, by which is meant the placing evenly over the surface of the scow which is being loaded, the ashes, etc., dumped into the chutes on the pier. For a number of years, the city has obtained for the privilege of thus picking articles of value from the rubbish as it is spread out and raked over, more than $90,000 in cash. In addition to this, there is at least half as much again received in work, the trimmers, of course, making no charge for their work.

Col. Waring ultimately intends to separate the garbage and ashes completely, in its collection, so that they may be utilized. Ashes in particular, have a large value, if kept free from vege-

table matter, in the way of filling up waste land, or even for the manufacture of artificial stone, fire-bricks, etc. Some experiments made by the department have shown that ashes, mixed with a small percentage of cement, form a hard compact mass that could be successfully used in making road or street foundations. The entire problem is one that seems as yet to be in its infancy—on this side of the water, at any rate.

THE GREAT SHERIDAN ROAD.

THE greatest project in road building undertaken in recent years in America is the Sheridan road—fittingly referred to often as "the great Sheridan road." A few public spirited citizens of Chicago have with admirable courage and by indefatigable efforts brought it through the difficult stages of advancement from a supposedly unrealizable but grand conception, to the point of assured accomplishment. How this has been done is in itself a story of the almost infinite possibilities of human intelligence and perseverance. In the beginning it was proposed that it should be a boulevard between Chicago and Fort Sheridan—the advocates hardly dared to propose more, but now that the way has been blazed, after years of untiring work, through seemingly insurmountable difficulties, it is to be, in the words of a Chicago writer, "two hundred and fifty miles of smooth road, at times skirting the breakers of old Lake Michigan, now plunging into the forest, and again meandering through the finest farming country the sun ever smiled upon—such is to be the future of the Sheridan road. Picture a broad highway extending from Chicago to Milwaukee, from Milwaukee through the lake-dotted and river-entwined country which separates the cream city from Lake Geneva; imagine that highway winding around the verdure covered hills which overlook that superb body of water from the village of Geneva Lake to Williams Bay; continue that road across the state line until it strikes the Fox river, through Huntley, Algonquin, classic old Dundee, and beautiful Elgin, and from the city of watches follow the route familiar to all lovers of bicycling past St. Charles, Geneva, Batavia, Aurora, Downer's Grove and Hinsdale, until it connects with the West Park boulevard sys-

tem, and you will have a faint prophetic vision of the Sheridan road of the next decade."

All this has been made possible by the passage of the Sheridan road bill by the Illinois General Assembly and its probable enactment by the Wisconsin legislature. It provides for the creation of park districts and the control of submerged lands and those bor-

LOOKING UP THE ENTRANCE TO THE SOUTH RAVINE OF THE SHERIDAN ROAD.

dering on navigable bodies of water. Through the creation of these park districts and the acquirement of land by condemnation for the purpose a way is opened for the road, and its construction and maintenance is provided for. The bill is a long one, and is a good model for similar projects in other states.

The Chicago *Times-Herald* has recently given several pages of space to the great project, covering all features of it. In one of these articles it says: "In this stupendous undertaking Illinois joins

hands with Wisconsin and Chicago with Milwaukee. The bill which lately passed the Illinois legislature almost without opposition will be submitted to the Wisconsin solons at their next session, and the leaders of both political parties in that state have pledged their support to the measure. There is not the slightest reason to doubt the passage of the bill, and already the wealthy citizens of Milwaukee are planning, not only to complete the road from there to Chicago but also to continue it along the lake north to Manito-

THE SHERIDAN ROAD ALONGSIDE A BROOK.

woc and southwest to Lake Geneva, which borders the Illinois-Wisconsin line. Manitowoc is eighty miles north of Chicago, and Joseph Vilas, a wealthy resident of Manitowoc, and president of the Lake Shore and Western Railroad, has pledged his word to the speedy completion of the road from Milwaukee to Manitowoc. This extension would carry the road through Whitefish Bay, Silver Springs, Fountain Park, Mequon, Ulao, Port Washington and along the unsurpassed lake shore from Port Washington to Sheboygan, and there on to Manitowoc. Those who have gazed on the beau-

ties of the park and landscape surrounding the Soldiers' Home in Milwaukee, and who have wandered on fishing expeditions among the countless lakes of Wisconsin can make a forecast of the possibilities of a road from Milwaukee to Manitowoc and from Lake Geneva to Milwaukee. One hundred and sixty miles of continuous roadway, most of it within sight and sound of Lake Michigan, with here and there a cozy roadhouse with refreshments for man and beast, is

A BEND IN THE SHERIDAN ROAD.

a prospect which conjures up pleasing anticipations. It is as yet too early to give with any accuracy the plans of the Wisconsin continuation of the Sheridan road, but it is a matter for congratulation that the leading citizens of Milwaukee, the metropolis of the state, are heartily in favor of the building of the road, and are on record as being ready to support with their influence and their money the comprehensive extension of the road under the magical name of Sheridan."

When Sheridan galloped his war steed to Winchester, twenty miles away, he did not think that his name and his fame would be immortalized in league after league of boulevard overlooking the glistening waters of an inland sea.

The leader of the movement is Mr. Volney W. Foster, the president of the Sheridan Road Association, and he is called "the father of the Sheridan roads." In speaking of the project he

A GLIMPSE OF LAKE MICHIGAN FROM THE SHERIDAN ROAD.

said: "The inception of the Sheridan road is of such recent date that it is not historical, but, on the contrary, is contemporaneous. Many of those who organized the Sheridan Road Association were residents of Evanston, that little city of homes, churches and schools. There was no good road to Chicago, and no continuous road on or near the lake shore. In the fall of 1887, a number of lunches were given at the home of one of these residents, at which an organization was formed, which subsequently became the Sheridan

Road Association. The purpose was to create a free pleasure drive, from Chicago to Fort Sheridan. A few of the early workers in this undertaking then believed that it was quite possible to extend the drive to Waukegan, and perhaps some time to Milwaukee. But they did not then dare disclose so large an ambition. Meetings were held in Chicago, and great interest was manifested. Following the organization of the association, meetings were held in the

ALONG A HILL ON THE SHERIDAN ROAD.

villages between Chicago and the state line. Dinners were given at various places, and orators developed on every hand. Ancient history and mythology were invaded to find types of great highways, and florid illustrations. I remember my friend, Alexander Clark, secretary of the association, instancing the advantage of good roads, and how, through such means, long and perilous journeys between Rome and Greece became possible, and so the men and maidens met; notably, said he, that visit of Leander to Helen, by the Hellespont route. He assured real estate owners of the extra-

ordinary advance in values which followed the construction and opening of the Via Appia. He urged the possibility of the establishment of a Monte Carlo of our own, which, he argued, would be likely to retain many millions of dollars now annually squandered abroad.

"Having organized the Sheridan Road Association, which was

THE SHERIDAN ROAD BETWEEN HILLS.

done without charter, and was wholly dependent on the voluntary co-operation of its members, we proceeded to practical work. It was first necessary to obtain consent to pass through Calvary Cemetery. Archbishop Feehan, of Chicago, at first gave us little encouragement, but finally gave us a strip 100 feet wide through the grounds, near the lake. The cost of grading and graveling this strip was $3,400, and we raised the amount by private subscription in two hours. About this time legislation was obtained, under the Bass bill, and subsequently under the Baker bill, which enabled municipalities to set

aside two pleasure drives, and to improve them, and to prevent heavy traffic. The village of South Evanston acted promptly in this matter, and improved Arnold avenue, and gave it the name of the Sheridan road. Evanston and Rogers Park followed and extended the Sheridan road from Greenwood street to the north end of the village. At the present time active work is in progress in almost every section between Chicago and the Wisconsin State line."

WHEELMEN ON THE SHERIDAN ROAD.

In a recent letter to the Sheridan Road Association, Governor Altgeld says that "the Sheridan road is one of the great achievements of the century. There will not be such another road in the world, and it will bring a harvest of honor to the men who are giving it time and effort."

When the townships between Chicago and the state line are all organized as park districts a conference will be held and a general plan of action mapped out. Daniel N. Burnham has volunteered his services and will undertake to design a general landscape effect

which will not detract from the reputation he won during the inception and completion of the Columbian exposition. While it is not possible to forecast exactly what will be done, there are certain features on which all the promoters are agreed, and which should prove of interest to the future travelers over the Sheridan road.

"One of the certainties," the Chicago *Times-Herald* says, "is the installation of coaching for the first time in the United States on a scale not equaled by England or by any other country. There is an abundance of capital which stands ready to construct, equip and maintain a coaching service for use along the Sheridan road. With the coaches will naturally come the wayside inns along the road. No pleasure party would care to make the run to Milwaukee in one day. The latter part of an afternoon and the night could be comfortably spent in a cozy hotel within sound of the waves and removed from the vexations of a city. On the following day the journey to Milwaukee could be completed. With the completion of the road to Lake Geneva and down through the Fox River Valley and back to Chicago, the 250-mile jaunting trip could be nicely made in a week. With regular lines of coaches or stages in operation, stop over could be taken of a day at various points, and two weeks delightfully spent."

Fountains and monuments will be interspersed along the road from Chicago to the state line. While the officers of the association will give out no names it is semi-officially stated that a number of wealthy citizens have already promised to each stand the total expense of a fountain, monument, or other landscape feature, which will bear the name of the donor. These will serve not only to beautify the road, but will be of more practical service as landmarks.

VOLNEY W. FOSTER, was born February 27, 1848, on his father's farm three miles from Jefferson, Wisconsin, on the Aztulan road. His father was Volney Foster, who moved to Illinois in 1836 from Antwerp, Jefferson county, New York, and settled at Jefferson, Wisconsin, in 1837. In 1850 he removed to Portage City, Wisconsin, where he resided until 1863. Here Volney W. Foster attended the public schools. In 1863 the family returned to a farm in Jefferson, Wisconsin. Volney W. Foster worked on the farm there until 1866, when he went to Milton College, at Milton, Wisconsin, for one year and was valedictorian of his class. The following two years he taught school in Farmington, and later in Jefferson. He then obtained employment with merchants of the village of Jefferson and in 1870 he went to work for J. E. Platt

a prominent merchant at Manitowoc, Wis., and in 1871 was admitted a partner in the firm of Platt, Gray & Foster, of that city. In 1873 he sold his interest in the firm of Platt, Gray & Foster, and went to Chicago, and obtained employment as clerk in the Chicago and Northwestern railway, afterward as traveling salesman, then as an agent in Chicago for a Wisconsin lumber shipper, later as cashier for James McDonnell & Co., lumbermen, and then he entered into partnership with A. R. Schulenberg, forming the firm of Schulenberg & Foster, lumbermen, Chatham, Ontario. The firm had a large and profitable business. While living in Chatham he was married to Eva Adelle Hill, daughter of Ezra N. Hill, Brockport, New York. In Chatham two children, Albert Volney Foster and Eva Cornelia Foster, were born to them. In 1879, Mr. Foster sold his lumber business in Chatham and moved to Chicago, and entered into partnership with W. D. Hitchcock, forming the firm of Hitchcock & Foster, dealers in lumber, and cedar and pavers, under the name of the Western Paving and Supply Company. In 1892 this firm dissolved, Mr. Foster continuing the paving business and Mr. Hitchcock continuing the lumber business. Mr. Foster has since been President of the Westtern Paving and Supply Company. Mr. Foster is a member of the society Sons of the American Revolution, Union League Club, and all the clubs of Evanston. In 1887 he began work on the Sheridan road enterprise, and has worked on it very diligently since. To him, more largely than to any one else, is due the credit of having brought the great project to the point of realization. He is a progresive, broad-minded man and one of the foremost public-spirited citizens of Chicago. Governor Altgeld, on August 19th, appointed him commissioner to represent Illinois at the Mexican International Exposition in 1896.

IMPORTANT FACTS REGARDING CEMENT AND ITS USE.

BELOW will be found a few paragraphs on cements,* taken from such authorities on the subject as Laxtan, Grant, Vicat, Drake, Reid, Gilmore, De Smedt, Michaelis, and Maclay, embracing a number of imporant points concerning the use and abuse of cement:

Well-burned, heavy, fine-ground cements are the best.

Cement work should not be tampered with after setting has begun.

Neat cement reaches its full strength in a much shorter time than a mixture of sand and cement, but tests show that the concrete mixtures gradually gain upon the neat cement, and ultimately reach and even surpass it in strength.

Good Portland cement continues to harden and attain a greater tensile strain for a long period, in some cases for three years. A mixture of one part sand to one part cement, tested in London, showed an increase of from 353 to 836 pounds on a 2¼-inch section at the end of seven years.

When bricks are laid in cement, they should first be well-wetted, as otherwise they absorb the water from the cement mortar.

* From "The Portland Cement Industry in the United States."

Badly-burnt, light-weight cement is to be avoided.

Salt water does not injure cement.

Clean water and sharp sand should be used with cement; the cleaner and sharper the sand, the better the mortar.

Portland cements differ from natural cements in that if kept away from dampness, they improve, instead of deteriorating, with age.

At the end of a year, a mortar of one part sand to one part cement has two-thirds the strength of neat cement; two of sand to one of cement, over one-half the strength of neat; three of sand to one of cement, nearly one-half the strength of neat; four of sand to one of cement, about one-fourth the strength of neat.

Loamy sand is a great enemy to good cement.

Cement and lime should not be used together in the same mortar, as one sets by the formation of hydro-silicate and the other by the formation of carbonate of lime. Their setting being different, the effect of mixing them is the ruin of the mortar.

Good cement may be drowned by an excess of water. The less water, the better the mortar.

In hot weather, cement work should not be allowed to dry too quickly. It should be sprinkled with water to protect it from the summer sun.

In masonry, the stone should be moistened before putting on the cement, as otherwise the water is absorbed from the mortar and setting is prevented.

The advantage of a moderately slow setting over a quick setting cement is that the former can be mixed up in larger quantities and used without retempering, whereas the latter sets before it can be used on the work, and when remixed or retempered, loses some of its strength.

Portland Cement is grey in color and crystalline in texture, the result of the high temperature at which it is burned, and the nearer a natural hydraulic cement approaches it in color and texture, the greater its strength.

The sand and cement should be well-mixed together, dry, before water is added, and the latter should be added little by little to the mixture.

Better and more uniform results are obtained with briquettes

having a breaking section of 1 by 1 inch than with briquettes, with a breaking section of 2¼ square inches.

In testing cements, the briquettes should be broken directly from the water, as an absence of water causes a cessation of the setting by the hydration of silicates in a true cement; but may cause, in improperly manufactured cement, containing inert or clayey matter, an artificial strength produced by cohesion, which, in time, is lost.

At the Chicago fire artificial stone made of Portland cement proved itself to be the one fire-proof building material.

Where cement is to be used in sea water it should, on account of the difference in the composition of sea water, be first tested in the water in which it is to be used.

Finely ground cement, when mixed neat, does not give as good results as one more coarsely ground; but when mixed with sand the fine ground cement will surpass the more coarsely ground.

Concrete should be made as required. If setting begins before it is put in place the concrete is worthless.

The smooth, clayey mortars made by the Rosendale and other cements are due to an excess of clayey matter in the cement, as evidenced by their want of strength when compared with the grey, crystalline, gritty mortars mace with the Portland, or the natural cements of that character.

Economy in use is proportionate to the adhesive strength of all cements, and this relative strength should always gauge the relative proportion of sand that may be properly used to accomplish a given purpose.

The setting of cement being a chemical operation, the finer ground the cement the more active particles, and, therefore, the quicker the setting, when the hydration by the adding of water goes on.

The quickness or slowness of the setting of cement is governed by the question of the temperature of the cement, the air and water. The nearer these approach to a common temperature, the quicker the setting; thus, in hot weather, cements set quickly, while in cold weather, where a material difference exists in the temperature of the cement, water and air, the setting is more slow.

Cements which set quickly neat are not necessarily quick-setting

when mixed with sand. By the addition of two or three more parts of sand, the setting of the quick-setting cement is quickly retarded to enable it to be safely used in all work.

By a series of tests covering a period of eight years, English engineers have ascertained that cement giving tensile strain neat between 300 and 350 pounds per square inch at 7 days, shows the the highest ultimate results and the highest percentage of increase per annum; while cements showing strains of 500 and 600 pounds per square inch at 7 days, show no ultimate gain, but an actual loss, and a very slight percentage of annual gain.

FILTRATION OF MUNICIPAL WATER SUPPLIES.

By Col. George H. Elliot.

There are two principal methods of filtration on a large scale, the one being known as mechanical, or rapid filtration, and the other as natural or slow filtration. The former is a somewhat broad term used to denote those systems of water purification in which an exceedingly rapid rate of filtration is made possible by means of mechanical devices for frequent, quick and thorough washings of the filtering materials without removing them from the filter.

The filters of this system, which is called the American system, are cylinders of iron or steel, containing filtering material, which is generally sand, and are extensively used by papermakers, bottlers, brewers, icemakers, laundrymen, and in other similar occupations. They are used also for the filtration of the public water supplies of several American cities, but so far none of the larger cities of this country have established filtration works for their entire water supplies. The cylinders are made vertical, in sizes up to 12½ feet in diameter and 16 feet high, and horizontal, in sizes up to 7½ feet in diameter and 35 feet long. The numbers of filters are regulated by the quantity of water to be filtered. The cleansing of the sand is ordinarily done by means of a reverse current of water during the stirring up of the sand by a rake with long vertical teeth, which is revolved horizontally by machinery through the sand. The

cleansing is done daily, or oftener, depending on the turbidity of the water.

In the American system there is a yield of filtered water of 3,000 to 4,000 gallons per square foot of filter surface per diem. This rapid rate is produced either by a great pressure or head of water on the sand, by which the water is forced at a rapid rate through it, or by frequent cleansing of the sand for the purpose of removing obstructions to a rapid passage of the water, or by both.

The objection to the first is, that fissures or channels are liable to be forced through the sand through which the water may pass without any modification; and, the objection to the second is that clean sand alone does not make an effective filter against bacteria contained in the water. This latter objection, it is claimed, has been overcome by the use of alum, which is said to combine with the carbonate of lime, existing to a greater or less degree in all natural waters, and to form a jelly-like substance (hydrate of alumina) on the surface, and in the interstices of the sand, which collects and retains the bacteria contained in the water until, after the stopping of the inflow, the reverse current is turned on and the sand is cleaned.

The amount of alum used, which varies with the turbidity of the water, is ordinarily about three-fifths of a grain to a gallon of water. It is one of the principal items of expense in this system. At Atlanta, Ga, 70,032 pounds of alum were used in filtering the 756,762,600 gallons of water used by that city in 1889.

By some the use of alum is objected to as dangerous to health, but it is claimed by the owners of the patent and makers of the filters that no alum passes through the sand and that none can be found in water filtered by this system when the process is used as directed. There is one point in connection with these filters that I have not seen mentioned. After the sand has been cleansed, and the water again passes downward through the sand, a certain time must elapse before the alumina jelly, on which the efficiency of the filter as against bacteria depends, is again formed on the surface and in the interstices of the sand and replaces that which has been washed away by the reverse current, together with the dirt retained by the filter. Until this time it is obvious that the water passing through

the filter should be wasted and not sent into the mains, but, as far as I have observed, this has not been done in any use of this system for the purification of public water supplies.

The slow method has been in use a long time in the largest European cities, including Hamburg, Berlin and London. It has also been adopted by certain American cities. It is not patented. In this system a filter bed is a small basin generally of an acre or less in size, with water-tight side walls of masonry or of earth paved with masonry. The number of beds required in any case depends on the daily supply of filtered water required. Above a system of drains are placed several layers of filtering material, increasing in fineness to the top. The lower layer is generally formed of small stones or broken stone, then, proceeding upward, there is coarse gravel, then fine gravel, then coarse sand, and lastly, at top, the filtering material proper, which is fine sand. The aggregate depth of the layers and the depth of each layer are not uniform in the different countries and in the different cities of the same country, but they vary with the materials available and the judgment of the engineers. The aggregate thickness of the layers is usually from six to eight feet and the thickness of the sand is from two to four feet. On this latter depth, the depth or pressure of water on the sand, and the degree of cleanness of the sand, mainly depend the vertical rate of fall of the column of water above the sand, the rate and the duration of the percolation of water through the sand, and the yield of filtered water per square foot of filter surface, and on them, in turn, depends the degree of efficiency of the filter, especially as against bacteria.

The efficiency of the filters depends on the slimy deposit that commences at once to form on the surface of the sand and in its interstices, and which, when in sufficient quantity, not only collects, but consumes and destroys the bacteria. When the deposit forms to such a degree as to impede too much the percolation of water, the upper portion of the sand is removed, and at proper intervals the entire body of sand is replaced by fresh sand. From time to time, as is found necessary, the water is drained from the sand and the filter is allowed to rest. The air which replaces the water oxidizes any organic matter that remains in the sand. In

order to protect the water from the heat of summer and from freezing in winter, filter beds should be roofed.

Professor Leeds, of Stevens Institute, makes this explanation of how the bacteria themselves purify the water: It is to see how the filters remove the dirt and suspend matter, but the way in which bacteria were eliminated was a complete mystery until the last four or five years. But few people had ever seen or examined bacteria before that period. It now has been shown that the bacteria remove the bacteria. The bacteria in the waters are comparatively few of a dangerous character; the great bulk of them are our greatest friends. It is through their aid, together with the oxygen of the air, that the filth in the water is destroyed. They feed upon it and they feed upon each other. Since that knowledge has been obtained, the object now is to cultivate the bacteria. In order to make the filter bed do its work effectively it is necessary that the growth of the bacteria shall be facilitated until a filter bed becomes populated with an incredible number of millions of them. As the result of their activity they multiply themselves in vast numbers, and they form, at the top of the filter beds and between particles of sand, a sort of jelly or slime—a bacteria jelly—and it is by the aid of this bacteria jelly that the bacteria in the unfiltered water are removed.

When a filter bed is first put in operation and afterward, after each of these changes, the water passing through the filter is allowed to run to waste for about ten days or two weeks, until it is found to be chemically and bacteriologically pure by a chemist and biologist constantly employed at the filtration works.

CURRENT INFORMATION.

THE PREPARATION OF STANDARD SPECIFICATIONS FOR PAVING BRICK.

The committee appointed at the last annual convention of the National Brick Manufacturers' Association, to prepare standard specifications for paving brick, held its first meeting in Indianapolis, on August 1st. The members present were: Daniel W. Mead, Rockford, Ill.; D. V. Purington, Chicago; Prof. Edward Orton, Jr., Columbus, O.; W. D. Richardson, Cleveland; Willard Beahan, Streator, Ill., and Frank B. McAvoy, Philadelphia, the only absent member being J. W. Jones, of Haydenville, O. Among others who were present for consultation were: F. F. Harrington, engineer in charge of the testing laboratory, of St. Louis; H. A. Wheeler, of the Missouri Geological Survey, and W. S. Blatchley, Indiana State Geologist.

The committee has before it a difficult task. At present, specifications for paving brick are greatly at variance in different cities, and not only do the manufacturers of brick suffer from this lack of uniformity, but the buyers do also, for necessarily some of the specifications are faulty, though they may not be wholly bad. The committee will endeavor to clear up all doubts, and to establish uniformity, based on exact knowledge. The committee is well qualified to do this, as it is made up of men who have had thorough experience as engineers, manufacturers and chemists, and who are specially interested in the work. It will be their aim to prepare specifications which will be as generally recognized as the standard for paving brick as are those for bridges, prepared by the committee of the American Society of Civil Engineers.

Nothing definite was accomplished at the committee's first meeting, further than to outline plans for proceeding with the work before them. Mr. Mead was chosen chairman, and Prof. Orton secretary, and they will have general charge of the work. Tests will be conducted in a number of laboratories and colleges, as well as by engineers, the results of which will become the basis of the committee's report.

The time for making the tests has not yet been definitely fixed, nor does the committee yet know when its report will be ready for the public, but Chairman Mead says that he hopes to have it outlined about thirty days before the next annual meeting of the National Brick Manufacturers' Association, so that it may receive careful consideration before being submitted to that body for discussion. He does not think, however, that the committee will be able to fully complete its work this year. In talking over the matter during a call at the office of PAVING AND MUNICIPAL ENGINEERING, he stated that the committee would undoubtedly have its work sufficiently advanced to be able to submit specifications to be adopted as a standard for the next year, but there will probably be additional work to be done and it may be a year later before the specifications

are perfected fully to the satisfaction of the committee. In determining the specifications it will be their idea not to do it on lines of exact measurements of qualities, but rather to fix limits within which brick must come as determined by tests; as, for instance, the standard specifications will provide that acceptable brick must, when tested for tensile strength, absorption, etc., come within limits for which a maximum and minimum will be fixed.

The committee asks the co-operation and assistance of all manufacturers and engineers and will be glad to receive any information that will be helpful to it in its work. The time for the next meeting has not yet been fixed, but will be held on the call of the president and secretary.

SECOND ANNUAL MEETING OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.

The second annual meeting of the American Society of Municipal Improvements will be held at Cincinnati on September 11, 12 and 13. The organization was formed at a meeting of representatives of about twenty cities in Buffalo a year ago, as a result of a movement started by Mr. M. J. Murphy, street commissioner of St. Louis, who is now the president of the society. The other officers are: First vice-president, G. H. Benzenberg, city engineer of Milwaukee; second vice-president, Geo. S. Gatchell, chairman of the board of commissioners of public works of Buffalo; secretary, D. L. Fulton, superintendent of highways and sewers of Allegheny; treasurer, A. Joraleman, chairman of the board public works of Newark.

The objects of the society, as set forth in its constitution, are, "to promote information upon, and best methods to be employed in the construction of municipal works, by means of annual conventions for social intercourse, and the reading and discussion of papers upon municipal improvements, and to circulate by means of an annual publication among its members the information thus obtained." The municipalities of the country and its officers who have charge or supervision of municipal works are eligible to membership. The admission fee for municipalities is $5 for each delegate to the annual convention, and $5 for each individual, in addition to which the annual dues are $3. The programme, as announced, is as follows:

FIRST DAY, WEDNESDAY, SEPT. 11, 1895.

10:00 A. M.—*a.* Convention called to order by Aug. Herrmann, chairman of the Committee of Arrangements.

b. Address of welcome, Hon. John A. Caldwell, mayor.

c. Response, M. J. Murphy, president.

d. Regular business meeting.

1:00 P. M.—Carriages will be in waiting at the headquarters, and the entire society and all visitors will be taken in charge by the local committee, the following being the itinerary: New City Hall; Cincinnati Art Museum and Eden Park; New Pumping Station (refresments); Eden Park Water Tower; Zoological Gardens.

The gardens will be reached about 5 P. M., where refreshments will be served. In addition to the regular attractions of the gardens, there will be the following for the evening: Grand concert by the Bellstedt-Ballenberg Orchestra, just returned from New Orleans, and especially engaged for this occasion; dancing on new pavilion; fire-works display.

SECOND DAY, THURSDAY, SEPT. 12, 1895.

10:00 A. M.—Regular business meeting.

1:30 P. M.—The society and all visitors will again be taken in charge by the local committee, and an inspection of the street-car system of Cincinnati made.

8:00. P. M.—Regular business meeting.

THIRD DAY, FRIDAY, SEPT. 13, 1895.

10:00 A. M.—Regular business meeting.

2:30 P. M.—All visitors will again be taken in charge by the local committee, and escorted to Government Square. Here a stand, seating 1,000 persons, will be specially erected for the society and visitors. Arrangements have been made to give a

partial exhibition of the fire and police departments in review and active service.

7:30 A. M. RECEPTION AND COMPLIMENTARY BANQUET TO SOCIETY AT GIBSON HOUSE.

At the banquet, the cities represented will be called in their alphabetical order, and to one representative from each will be allotted three minutes time to respond. All persons attending must be on hand promptly at the time mentioned. *Business suits only.*

FOURTH DAY.

10:00 A. M.—Gibson House.

All members of society and visitors remaining over will again be taken in charge by the local committee, and taken to the City Infirmary, where the day will be spent.

The chairman of the local committee on arragements is Mr. Aug. Herrmann, the other members of which are John B. Washburn, John Frey, Geo. T. Sterritt, members board of administration; A. P. Butterfield, secretary; Willis P. Tharp, superintendent waterworks; H. J. Stanley, chief civil engineer; Dr. J. W. Prendergast, health officer; Fred Amthauer, superintendent street cleaning; Ed Bogen, superintendent city infirmary; R. H. Warder, superintendent of parks; Elliott Marfield, purchasing agent; J. A. Cabot, electrician; heads of departments under control of board of administration.

The local committee has selected the Gibson House, situated on Walnut street, between Fourth and Fifth streets, as the headquarters for the society, and College Hall, just opposite this hotel, as the convention hall. Immediately upon their arrival in the city all members, or persons desiring to become members, or other visitors, should apply at headquarters and obtain their proper badges and credentials, which will entitle them, free of charge, to the following privileges, the courtesy having been extended to the society: Cincinnati Zoological Gardens, Cincinnati Art Museum, Chamber of Commerce, Cincinati Street Railway Co., Cincinnati Observatory, Society of Natural History, Mt. Adams and Eden Park Street Railway Co., Cincinnati Inclined Plane Railway Co., Bell Telephone Co., including the use of the long-distance telephone, at the general office of the company, Telephone Building, Vine street, south of Fourth.

The Cincinnati committee in charge of arrangements has issued a very handsomely printed souvenir, setting forth the history and constitution of the society and the programme for the meeting, together with helpful and interesting information about Cincinnati and its attractions. The book also contains a number of good pictures of Cincinnati scenery.

A letter from Chairman Herrmann to the editor of PAVING AND MUNICIPAL ENGINEERING states that the executive committee has not definitely completed arrangements as to who will read papers, and adds: "It seems to me that there will not be much done in this line this year. In fact, it looks now as if the organization will simply get together on a permanent basis. At the first meeting held in Buffalo there were probably seventy persons present. We have now received nearly two hundred favorable replies, representing about seventy cities, and it is expected that not less than two hundred and fifty delegates will be present."

The following letter has been received from Mr. Fulton, the secretary of the Association:

ALLEGHENY, PA., Aug. 26, 1895.

To the Editor of Paving and Municipal Engineering:

A very elaborate programme has been prepared by the local committee of Cincinnati, O., for the entertainment of the American Society of Municipal Improve-

ment. I am receiving the subjects daily for the papers which are to be read at our meeting on the 11th of the coming month. One of the papers will be, "Lack of Uniformity in Firebrick Specifications;" another, "Disposal of City Garbage;" another, "Improved Street Pavement."

We had last year, I believe, fifty-seven delegates, representing some twenty cities. We are led to believe, from responses so far, that we will have at least two hundred and fifty delegates from over seventy cities.

Revising our by-laws will probably come up, as they were gotten up in a hurry last year, without time to make them as complete as we would have liked.

This will no doubt be a very interesting meeting, as we will have parties from all over the United States in attendance. * * * There will be something of interest to all our cities, great and small, and our public works officials should not miss this opportunity to learn how work is carried on in their neighboring city. It would be impossible to give a good list of the papers to be read before the time of meeting in Cincinnati. *D. L. Fulton,*
Secretary A. S. M. I.

A NEW HAVEN COMMITTEE SEEKING INFORMATION.

The street committee of New Haven, Conn., consisting of Aldermen F. S. Hamilton, J. V. Rattlesdorfer, and Councilmen F. Chillingworth, W. H. Forsyth, and Joseph Ullman, visited Buffalo and Syracuse, August 7th and 8th, to investigate the question of street paving. This was the second trip that the committee has made, and it has since held public meetings for the purpose of learning the views of citizens as to the merits of the different kinds of paving. The statements and opinions offered at these meetings are chiefly remarkable for their lack of correct information, and if the committee is to be guided by the advice which comes to it in this way, there is about equal certainty that it may or may not get satisfactory results. It would be quite as well to permit a question of architecture to be settled by town meeting talk. However, the official report subsequently submitted by the committee was evidently not based on the information volunteered by citizens. The committee recommended a foundation of broken stone or concrete for all pavements, and favored both asphalt and brick for a surface material under certain conditions. Permanent paving is badly needed in New Haven, and much of it is to be done, but probably not before next year.

AN IOWA DECISION ON STREET IMPROVEMENT ASSESSMENTS.

A paving decision has been rendered by Judge Wolfe, at Davenport, Iowa, who holds that the city can only tax abutting property, no matter how narrow, for street improvements. The decision relates to a narrow triangular piece of ground, two feet wide, lying between Front and Fourth streets, which the city assessed as an entire block, when suit was brought by the parties owning the ground. A preliminary injunction was granted and the decision rendered by Judge Wolfe makes the injunction perpetual.

RESTRICTIONS ON PERMITS FOR STREET IMPROVEMENT IN ST. LOUIS.

The board of public improvements, St. Louis, contemplates putting a stop to the practice of granting permits to property-owners to improve streets at their own expense. Permits granted in future will be under rigid conditions; the pavement will be considered temporary only, and the city will have the right to order it relaid at any time, the city assuming no responsibility. The board is not acutally prohibited from granting permits, but by setting

forth the above provisions, paving the street is done absolutely at the responsibility of the property-owner.

DAMAGE TO ASPHALTIC PAVEMENTS BY THE SPILLING OF OILS.

The damage that has been done in the past to asphaltic pavements in Washigton, D. C., by spilling on them gasoline, kerosene, or other oil, thereby causing a chemical change which rapidly decomposes the asphalt, has led the commissioners to endeavor to adopt regulations making it unlawful for any persons to spill their oils on the pavement, and compelling the oil delivery wagons to arrange a tray under the faucets of their supply tanks to prevent dripping. Schenectady, N. Y., has such a law; Detroit, also found it necessary to adopt such a regulation, and the commissioners of the District will embody in the regulations they adopt all of the good features of the Detroit regulations. A fine of $100, together with costs, will be the penalty imposed for a violation of the regulation.

INSPECTION OF BRICK PAVEMENTS IN EASTERN CITIES.

The brick-paved streets of Philadelphia, Germantown and Trenton were inspected, July 31, by Mayor Lebuecher, City Engineer Sherrerd, some of the members of the board of public works and the commissioners of Newark, N. J. In Philadelphia and Germantown fourteen streets were inspected. The first brick pavements laid were, for the most part, on sand foundation, but the more recently paved streets have concrete foundations. The pavements on sand foundation had been down seven years and are still in a very fair condition. Those on concrete foundations have been laid three years and are in excellent condition. It was found that there was little danger from slipping on the pavements, even where the grade was as high as 13 per cent.

The best brick pavement in Trenton was found to be Greenwood avenue, laid in 1891. Although receiving more than its share of traffic, on account of the streets running parallel to it, this pavement was found to be "as good as new, showing hardly a sign of wear." It is laid on concrete, and the interstices are cemented. A number of other streets were inspected in Trenton, some of them on a sand foundation, all of which were in good condition. There are four miles of brick pavements at present in course of construction in Trenton.

RULES AND REGULATIONS FOR CUTTING INTO STREET PAVEMENTS.

The board of public works of Indianapolis, adopted a new set of rules, August 2d, regulating the rights of persons to cut into improved streets for the purpose of making gas, water, and sewer connections. The regulations are as follows:

For each and every opening of any sort in a street improved with asphalt, vulcanite, brick, granite, wooden-block or macadam, not under guaranty by a paving contractor, $10, and an additional charge of $3 for each square yard of pavement displaced or torn up in entering into such street or on account of such entering or any work or occurrence in connection therewith. A deposit shall be made before permit is issued of $6 for each square yard of the estimated area of pavement to be relaid.

The holder of the permit will fill trench according to regulations, and the city will replace the concrete and wearing surface. When the work is completed the total area of pavement replaced will be measured, and a charge of $3 a square yard will be entered against the deposit. The remainder, if any, will be returned to the holder of the permit.

For each and every opening in a sidewalk improved with asphalt or cement, not

under guaranty by a paving contractor, $5, and an additional charge of $2 for each square yard of pavement displaced or torn up in entering into such sidewalk, or on account of such entering, or any work or occurrence in connection therewith.

A deposit shall be made before permit is issued of $6 for each square yard of the estimated area of pavement to be relaid The holder of the permit will fill trench according to the regulations and the city will replace the concrete and wearing surface. When the work is completed the total area of pavement replaced will be measured and a charge of $2 a square yard will be entered against the deposit. The remainder, if any will be returned to the holder of the permit.

For each and every opening of any sort in a street or sidewalk improved with asphalt, vulcanite, brick, granite, wooden block, macadam or cement, under guaranty by a paving contractor, $10, and permit will only be issued when permit is issued by the contractor holding the guaranty, stating that satisfactory arrangements have been made with him for replacing the street or sidewalk without interfering with his guaranty of the street or sidewalk. The holder of permit will be responsible for the condition of the opening and for the proper protection of the same until the city has begun the work of replacing the wearing surface.

The requirements for improved streets, sidewalks and alleys are as follows:

For each and every opening for laying gas or water pipes, $1.50.

For each and every opening for laying sewer pipes, $3.

Water and sewer pipes, or gas and sewer pipes shall not be laid in the same trench or opening.

For each and every opening for laying sewer pipes, where it is necessary for the city engineer to set stakes for the work, 3 cents a lineal foot of opening; no charge to be less than $5.

For setting stakes for and inspecting the grading or grades and graveling of streets and sidewalks, 3 cents a lineal foot of street; no charge to be less that $5.

For inspecting and setting stakes for the construction of brick sidewalks, 3 cents a lineal foot of sidewalk; no charge to be less than $5.

For inspecting and setting stakes for the construction of cement sidewalks, 10 cents a lineal foot of sidewalk; no charge to be less than $5.

For setting stakes for private driveways, $2.

For setting stakes and inspecting setting of curb, 2 cents a foot; no charge to be less than $3.

AN INSTANCE OF GOOD ROADS BUILDING.

A system of road building has been adopted by the county court of Jackson county, Mo., which shows a well defined system of grading and macadamizing for the thoroughfares of the county. The construction of five great roads, each beginning in Kansas City, and extending to the borders of the county, in five different directions, is under contemplation. These five roads, added to the forty-four miles already completed, will give 116 miles of thoroughly macadamized roads, and as fast as possible cross and lateral roads will be laid and macadamized, until Jackson county is under a uniform system of macadam. These roads will cost Jackson county, not including the building of bridges and culverts, and the building of cross and lateral roads, nearly $400,000. This plan is being taken up, also, by Wyandotte and Johnson counties, Kan.

NO PROTECTION AGAINST COMBINATIONS OF CONTRACTORS.

The members of the Board of Public Improvements and the city counselor, at St. Louis, claim that under the laws of Missouri and the ordinances of the city of St. Louis, there is no protection against what is termed "by-bidding," which means the combining of city contractors, and, until some outside contractor comes in, or one of the members of the combine breaks the agreement, the city is powerless, its only recourse being to refuse to award contracts and again advertise for bricks.

BROKEN STONE AS A SUBSTITUTE FOR COBBLESTONE IN BALTIMORE.

City Commissioner Douglas, of Baltimore, has suggested that in-

stead of using rubble or cobblestones, when first paving a street, that broken stone 12 inches in depth be used, and later, when an improved pavement is required, a solid foundation would thus be ready without the expense of tearing up the old pavement. The cost of rubble and cobblestone pavements ranges from 63 to 90 cents a yard, and broken stone is 54 cents.

ASPHALT PAVING OVER COBBLESTONES IN BUFFALO.

The first piece of asphalt paving over cobblestones laid in Buffalo, N. Y., was on the west side of Main street, intercepting Tupper, and it withstood the wear eight or nine years. Since then, Irving Place, and Hudson street, and Front avenue have been resurfaced in that manner. The cost is only about two-thirds of what it is to lay the pavement under the general specifications. When asked recently, why resurfacing had not been more generally resorted to, Assistant Chief Engineer Guthrie said: "I don't know. The idea was never taken up here until recently. They have had a good deal of experience with it in New York and I believe the result is found satisfactory. Irving Place, where it has been tried here, is of course, a residence street, and consists of but one block extending from Allen to North street. The pavement there has given satisfaction and the saving in cost is, I should say, more than one-third as compared with the general method. Of course, most of the paving is done here on petitions prescribing the kind of pavement and how it shall be laid. In many cities this is left to be determined by the city authorities. Ninety per cent. of the paving done in Buffalo is done on petition circulated by those interested in doing the work. Two-fifths of the property-owners owning a majority of the feet of frontage determine the sort of pavement to be laid, unless, in rare cases, where it is done by the council on what is called notice of intention."

"After the five years guarantee given by the paving companies expires, the repairs are to be by the city, are they not?"

"A year ago I made up a table dealing with the cost of these repairs, from which it appeared that since 1885 the average cost has not exceeded five cents per square yard. Some streets in a total of 750,000 square yards have been under repair eight or nine years. Comparing the older with the more recently repaired streets we find that the cost per square yard does not vary materially, although, of course, the total to be repaired increases. The first asphalt pavement laid in Buffalo was on Delaware avenue, from Virginia street to North. That was in 1878. It was resurfaced in 1892. In 1879, Franklin street received its first coat of asphalt, and it seems to be wearing clear down to the concrete, although it has not in all those years received more than $2,500 to $3,000 worth of repairs. The earliest asphalt in Buffalo was laid by the Abbott Company which preceded the Barber Company. Originally broken stone filled with tar, was all that was used with the coating of asphalt."

CALIFORNIA'S ROCK CRUSHING PLANT.

The state road rock crushing plant at Folsom, near San Francisco, Cal., will be in operation by November 1. A site has been selected for the rock crushing and

screening plant about half way between the power house and the lower line of the prison. It is thought now that if nothing interferes there will be enough rock on hand by the latter part of December to begin improving the roads. The rock will come from the Folsom prison quarries, and is a dark blue basalt. Engineers pronounce it one of the best road rocks ever found in the state. The present plan, under the laws providing for road improvement, is to sell rock for highways to the various counties that may need it. The price will not be more than $1.75 a cubic yard, and will possibly be less than $1.50.

THE ROAD SYSTEM OF QUEEN'S COUNTY, N. Y.

A map of the county road system of Queen's county, N. Y., has been filed by County Engineer McLaughlin, in accordance with the provisions of the new law. The system includes 75 miles of macadamized county roads, costing on an average of $15,000 per mile. Through the county three main lines extend. Besides the main lines several short lateral lines are built, and about 75 miles of other macadamized roads have been constructed by the different towns, which have cost on an average of $12,000 per mile. The Queen's county road system is said to be the most completely and intelligently planned and worked out of any county system in the United States.

MEETING OF NEW ENGLAND WATER-WORKS ASSOCIATION.

The fourteenth annual meeting of the New England Water-Works Association will be held at Burlington, Vt., Sept. 11th, 12th and 13th. The programme embraces the following papers: "Fire Service of the City of Marlboro," by B. R. Felton, city engineer of Marlboro; "Electrolysis," Professor Storrs, University of Vermont; "Water Supply of Lynn," John C. Haskell, superintendent, Lynn, Mass.; "Water-Works Finance," Freeman C. Coffin, C. E., Boston; "Advisability of Having Tests of Water Meters, and of Other Articles of Commerce Conducted by the Association," Clemens Herschel, C. E., New York; "Uniformity of Methods in the Bench-Testing of Water Meters," John Thornton, C. E., New York; "The Water System of Burlington, Vt.," by F. H. Crandall, C. E., Burlington, Vt.; "The Sanitary Condition of the Burlington Water Supply," William T. Sedgwick, Ph. D.; "Attaching and Care of Water Meters," R. C. Bacot, Jr., superintendent of water department, Port Chester, N. Y.; "A Brief Description of the St. Louis Water-Works," Desmond Fitz Gerald, C. E., Boston; "Calorific Determination of the Value of Fuel," Geo. H. Barrus, C. E., Boston; "A Short History of the Manchester High Service," Chas. K. Walker, superintendent, Manchester, N. H.; "Views of the New Works at Waterbury," R. H. Cairns, C. E., Waterbury, Conn.; "Modern Pumping Engines," Francis M. Dean; M. E., Boston; "The Metropolitan Water Supply of Massachusetts," A. F. Noyes, C. E., member of Massachusetts Sewerage Commission; "Operation of a Pumping Plant by Electricity," Charles A. Hague, C. E. The entertainment arranged for visitors includes a trip on Lake Champlain, a visit to Ausable chasm, and other points of interest. Special railroad rates may be obtained by writing to the secretary, J. C. Whitney, Newton, Mass.

HOW BRICK PAVEMENTS ARE TO BE LAID IN SEATTLE.

In answer to a question as to the specifications for paving Front street with brick, at Seattle, Wash., City Engineer Thompson said: "The first step will be to make secure or rebuild defective retaining walls and sewers. We will then take off of and out of the ground all wood or other substances which would be unsuitable in a foundation. The city's twelve and a half ton steam roller will then be put on and the ground rolled until it is thoroughly compacted. About six inches of gravel will then be put on the surface, and this in turn thoroughly rolled. Over this will be laid six inches of concrete, made of basalt macadam bedded in a matrix of Portland cement mortar. Over this will be spread a sand cushion of about two inches, on which will be placed the vitrified brick, constituting the wearing surface of the pavement. These will be tamped down onto and into the sand cushion, with a heavy rammer, until the rammer will rebound from the brick. Every small crevice will then be filled by pouring very fine sand, heated quite hot. This hot sand runs like water. Over this will be swept a coating of clean sand, which will be left on a short time. The end sought to be attained is to make such a rigid foundation, and to so solidly and compactly set our brick over it, that there will never be either settlement or sag in the foundation, nor the least possible movement of the individual brick. Such a condition favors the long life and cheap maintenance of the pavement. We will not attain a perfect ideal on Front street, but we will come as near it as existing physical conditions admit of, with a reasonable financial outlay. When it is done I think it will give satisfaction."

DENVER'S NEW REQUIREMENTS OF PAVING CONTRACTORS.

A paving order adopted by the Board of Public Works, August 7, at Denver, Col., will require future specifications for asphaltic paving to provide that no contract shall be awarded to a contractor until he has shown that he has the material, has the ability to do the work, and has laid an asphaltic pavement which has been down for a sufficient length of time to demonstrate its wearing qualities. The board has also decided that gutters shall, in the future, be of vitrified brick filled in with asphalt. Granolitic gutters and asphalt have been tried heretofore.

CONTRACTORS MUST OBTAIN PERMITS IN PITTSBURG.

An important change in regard to the indiscriminate tearing up of streets has been decided upon by the department of public works, at Pittsburg, Pa., and hereafter a permit will have to be obtained from the bureau of highways and sewers, when contractors lay pipes or build sewers for the city. There are laws governing the matter, and many contractors had to live up to these, but they were not enforced when contractors were under contract with the city, on the plea that they were doing city work.

THE CLAY-WORKING INDUSTRIES OF THE UNITED STATES.

The statistics of the clay-working industries of the United States are reviewed in the report of the Geological Survey. A list of over fourteen thousand operators has been procured, and information ob-

tained from nearly all of them. The total value of the clay products of the United States for 1894, including pottery, was over $65,000,000. The only comparison that can be made is with the census of 1890, which placed the value at $67,000,000. Fifty-three per cent. of this value was in bricks, which numbered 6,152,000,000. There were enough of them to make a walk over eleven feet wide around the globe. Ohio stands at the head of the states in clay manufacture, its products being valued at $10,668,000, or over 16 per cent. of the product of the whole country. The other states follow in this order: Illinois, 13 per cent.; Pennsylvania, 11; New York, 8; New Jersey, 6; Indiana, 5; Missouri and Iowa, 4; Massachusetts, and Michigan, 3½; Maryland, Wisconsin and Minnesota, 2 per cent.

GROWTH OF THE CEMENT INDUSTRY IN CANADA.

The fourth report of the Bureau of Mines of Ontario, gives particular attention to the manufacture of cement in Canada, and shows that, on the basis of value, the industry has increased from $91,658 in 1880, to $251,175 in 1890. The whole of this product was consumed in Canada, but it was far short of supplying the needs of the country. The importations in 1891 amounted to $323,690. The demand has increased 525 per cent. in twelve years—a rate which, it is said, has not been equalled in any other article of Canadian importation. What is the secret of it, and is the demand likely to be maintained?

The answer to these questions, "may be summed up," says the report, "in a significant term of very modern usage on this continent, viz., good roads. The setting in of the era of good roads in this country, as well as in the United States, does not date back ten years, but in that short period much has been learned on the subject, and the street engineer is now as much of a specialist and quite as useful in his way as the military engineer or the mining engineer. The Roman roads of Europe, which have outlasted the traffic of two thousand years, have taught him the invaluable lesson that the only sure way to make a good road is to lay a good and strong foundation. But instead of using stone material, as the Romans did in constructing their great military roads, he has adopted the concrete used by them in the construction of temples and other public buildings, some of whose walls have been standing 2,400 years. The great dome built by Agrippa, the friend of Augustus, 'the immortal monument of the Pantheon,' as Gibbon described it—now the church of Santa Maria della Rotonda—is an edifice in concrete, and though ravaged by fire and assaulted by the Huns and Goths, it is still intact after more than 1,900 years. Concrete is the street engineer's material for street building, and his chief reliance in the making of it is not Roman or any other kind of natural cement, but the stronger and more durable Portland. In Toronto during the last five years not less than 150,000 barrels of cement have been used in making concrete for street construction, and of this quantity Mr. Rust tells me that not more than 4,000 barrels have been the native hydraulic cement. 'Up to the last year or two,' he says, 'it was all imported Portland cement from Europe.' In other towns and cities of the Dominion cement is also being used in steadily increasing quantities in building sewers and

streets, and the results are so uniformly good that the material promises to grow steadily in favor. It is almost certain then that for many years yet to come the demand for Portland cement will continue as experience proves the utility and permanency of the concrete roadbed."

The report asserts that there is in Ontario an abundance of raw material for the production of Portland cement. "In scores of localities," it states, "beds of white shell marl, of large extent and excellent quality are found, some of them at the bottom of lakes in which myriads of fresh-water shells yet survive, to add to the thickness of the deposit, as one generation follows another, and others of them on the sites of lakes long ago filled up with peaty mold or drained by continental elevations. This marl, if unmixed with sand, clay, peat, or other matter of mineral or vegetable origin, is almost pure carbonate of lime, and furnishes the principal material for the manufacture of Portland cement. The necessary proportion of clay is a matter of experiment, but in all cases the purer and more uniform the quality of the marl, the easier it is to get a right mixture."

STREET PAVING DIFFICULTIES IN SEATTLE.

A difficult question presents itself to contractors and civil engineers in the selection of a suitable paving material for the hill streets in Seattle, Wash. They are so steep that to pave them with brick would not only give an insecure foothold to horses, but would prove a menace to pedestrians in slippery weather. The same objections are raised to cobblestones. Vulcanited wood has been proposed by City Engineer Thompson. A great deal of interest is being shown in the matter now, although the city has not yet reached the point of paving these hill streets. An effort is being made by local business men to induce an eastern firm to locate a plant in Seattle for manufacturing prepared fir, hemlock and spruce for street paving.

STREET-CLEANING MOVEMENT IN ST. LOUIS.

A joint committee, representing the Mercantile Club, Merchant's Exchange and the Business Men's League, of St. Louis, is endeavoring to compel a more vigorous enforcement of the municipal ordidinances against sweeping or depositing refuse on the public streets. As a first step they have directed attention to the general violation of these ordinances and have given warning that in the future prosecutions will be instituted. The city officials have promised their aid in the movement, which, it is hoped, will result in cleaning the streets of St. Louis.

PAVING MATERIAL IN WASHINGTON STATE.

Mr. G. N. Alexander, street commissioner and superintendent of sewers, of Seattle, in a recent letter to PAVING AND MUNICIPAL ENGINEERING says:

"The city of Tacoma is laying fir wood for paving, and we hope that both that and the cedar will prove successful, for we are blessed with a great deal. Our paving brick is of local make, too, and as we have fine granite within a short distance, we think we are well supplied with paving material."

PERSONALS.

Laban C. Burr, mayor of Tolono, Ill., died August 13.

Jacob Yost has been appointed road supervisor of section F, at Newark, N. J.

J. A. Harmon, of Peoria, Ill., is superintending the construction of sewers, at Macomb, Ill.

Egbert Jamieson and Philip Henrici have been appointed members of the Lincoln Park board, at Chicago, by Governor Altgeld.

Björn Edwards, of the firm of B. Edwards & Co., proprietors of *The American Contractor*, died in Chicago, July 31, from injuries received in a fall from a building in course of construction, of which he was proprietor.

Leverett L. Buck has been appointed chief engineer of the East River bridge, from Grand street, New York, to Broadway, Brooklyn.

F. H. Bader, mayor, and councilmen F. B. Bowman and C. D. Morrison, of East St. Louis, Ill., visited Peoria, Ill., Aug. 13, to inspect that city's brick pavements.

M. F. LeComec, director-general of the new Panama Company, at Panama, and W. I. Thornton, secretary of the association, inspected the drainage canal, at Chicago, July 29.

At a council meeting, August 12, at Quincy, Mass., Mayor Hodges appointed the following sewer commissioners: H. T. Whitman, one year; William T. Shea, two years; Paul R. Blacknur, three years.

ANSWERS TO QUESTIONS.

[By J W. Howard, B. L., C. E., for PAVING AND MUNICIPAL ENGINEERING.]

[Questions upon street construction above, upon or below ground, will be answered in PAVING AND MUNICIPAL ENGINEERING, if of general interest. Address Question Department, PAVING AND MUNICIPAL ENGINEERING.]

Is a width of 9 feet enough for the macadamized portion of a country road subjected to but light travel? A. F. K.

The width of country roads must vary according to the locality and traffic. Assuming the traffic to be less than twenty vehicles per hour, and the road well drained, a macadamized surface 10 feet in width would be as narrow as consistent with eventual economical maintenance. Two wings, one on each side, each 8 to 10 feet wide, should be constructed with earth. These are pleasant for light travel during good dry weather, and thus relieve the macadamized surface of much wear.

Local conditions differ so much in various parts of the country, even on the same road, that it is not possible to give a general rule governing even the width of the macadamized portion of a road. Some roads are built in southern New Jersey which have attracted attention, because of their extreme low cost; but when we remember that their total width was but 20 feet, with a macadamized portion 8 feet wide, laid without telford foundation, and that the thickness of the macadam was but 8 inches, it is easily seen that these roads will eventually become expensive to maintain, or if neglected, will practically have to be rebuilt. It would have been better economy in the end, if there had been 10 feet of the macadam, and of a thickness from 9 to 10 inches. A thin macadam road must be con-

stantly repaired; a thick macadam road can be periodically repaired.

How should gutters of asphalt-paved streets be made to avoid the disintegrating effects of water? W. W. F.

If the street has sufficient grade or longitudinal fall to cause the water to run easily along the gutters to the catch basins of the sewers, it is best to pave the entire street from curb to curb with asphalt pavement. If the fall of the street is so slight that water will run but slowly or stand still when the gutters contain a little dirt, then great care is necessary in paving such gutters with asphalt. If asphalt is used for paving the gutters in such cases, it is wise to see that the concrete foundation and the curbstone are firmly in place, so that water can not get between them. The curbstone should be either set in the concrete or have the earth back of it firmly rammed to keep the stone from slowly working away from the pavement. Before the asphalt pavement is laid in the gutters the vertical joints between the ends of the curbstones must be carefully filled with hydraulic cement or "pointed" from the surface of the concrete to the top of the curb. This is to prevent water running between the ends of the curb. Next, hot asphalt cement should be smeared or painted along the joint or intersection of the curb and concrete to about one inch in height on the curb and three or four inches on the concrete. Then the pavement, when laid, should not only be rolled with a steam roller in the gutters, but compressed by the sharp compacting blows of the hot paving rammers for a width of about a foot along the curb. Finally, before the pavement is cool, hot asphalt cement should be painted over the finished pavement for a width of at least a foot along the gutters and rubbed in with hot iron smoothing irons. The gutters of asphalt paved streets, when thus completed, will seldom, if ever, disintegrate.

In Washington some streets are being laid with specially made gutter bricks, which are laid over a width of about 14 to 18 inches along the curb. The joints of these bricks are thoroughly filled with Portland cement and the surface often covered with hot asphalt cement.

Is sprinkling sufficiently injurious to asphalt pavements to make it objectionable? *J. P. D.*

Upon asphalt pavements properly laid and properly cleaned, light regular sprinkling is not injurious. It is wise to read the preceding question and its answer in this connection, for it is the gutters which suffer most under constant excessive sprinkling, especially if the street is not kept clean. If the street has sufficient fall for the water to run off and away easily, drenching it with water may clean it. If an asphalt pavement has little depressions and the gutters are poorly constructed, then regular sprinkling injures the asphalt. On the whole, however, a little light sprinkling with the horses trotting, is pleasant during warm weather, and will cause no appreciable injury to an asphalt pavement.

Should paving bricks be slightly beveled or have square edges? *H.*

Best if slightly beveled, except perhaps, at the ends. If not beveled the traffic soon chips off the edges to an irregular bevel and it would have been better to have started with a regular slightly chamfered or beveled edge which, in a measure, prevents the edges from breaking off.

Should the names of any special bricks be specifically stated in city specifications as acceptable for use in laying brick pavements in the city? *M.*

The best plan is to definitely state the tests to which the sample bricks submitted by different bidders are to be subjected. The specifications should definitely state the maximum and and minimum sizes acceptable. The required tests of absorption, transverse strength, abrasion, impact, rattler or tumbling, these and other tests should be minutely described and the requirements stated. It is a well known fact that some brick manufacturers make several qualities of bricks as well as bricks with several names, which, taken in conjunction with the fact that the products of the same kiln are not always alike, demonstrates at once why definite tests should be named in specifications and not the names of the bricks acceptable to the city. This is done in most materials of engineering and building construction and should, without doubt, apply to the materials of pavements. Tests should be made before the work is begun and always at short intervals during the progress of the work.

LEGAL DECISIONS.

[Reported Specially for PAVING AND MUNICIPAL ENGINEERING.]

Power of City to Enforce Sewer Assessments.—The charter of Indianapolis (Acts 1891) authorized the city to exercise the power of eminent domain, and to provide upon what terms real estate might be drained, and declared that, when a sewer was intended and adapted only for local use of property-owners adjoining the street in which it was built, its cost should be paid by the abutting owners. It was held that the city had power to construct a sewer in the street in front of one's land, and assess his land therefor, though he received no benefit from it, and had previously been assessed for a sewer in the the rear of his lot. The necessity for a sewer is a matter to be determined by the municipal officers, and, unless there has been an abuse of discretion, the courts can not interfere, even though the officers have erred in judgment. Coburn *v.* Bossert (Appellate Court of Indiana), 40 N. E. Rep. 281.

Liability of Municipality for Surface Water.—Where a municipal corporation, by grading and paving streets, prevents the absorption of rain, which is consequently discharged on adjoining land in greater quantities than it would otherwise have been, the municipality is not liable for the damages caused thereby, as it can not be compelled to construct drains to dispose of surface water. Anchor Brewing Co. *v.* Village of Dobbs Ferry (Supreme Court, General Term, Second Department), 32 N. Y. Sup. Rep. 371.

Liability of Municipal Corporations for Nuisance.—Municipal corporations are liable for injuries caused by creating and maintaining nuisances. The fact that a person connected his house with a sewer does not estop him from suing the municipality for a nuisance arising from the maintenance of the sewer. Bolton *v.* Village of New Rochelle (Supreme Court, Gen-

eral Term, Second Department), 32 N. Y. Sup. Rep. 442.

Duty of City to Maintain Sidewalk.—Where a city permits a sidewalk to be maintained beyond the sidewalk line as fixed by ordinance, and exercises control over it, its duty is to maintain the whole walk in repair, City of Chadron *v.* Glover (Supreme Court of Nebraska), 62 N. W. Rep. 62.

Front-Foot Rule in Street Assessments.—Inequality in the surface of land abutting on a street does not authorize any departure from the front-foot rule in assesments, when that rule is expressly enjoined by this statute under which the improvements were made. City of McKeesport *v.* Busch (Supreme Court of Pennsylvania), 31 At. Rep. 49.

Damages for Change of Street Grade.—The fact that a change of street grade was ordered by a city to enable it to construct a system of sewers calculated to abate a nuisance does not relieve it from the duty imposed by const., art. 16, sec. 8, of making compensation to an abutting owner for the depreciation in the market value of his property consequent on the change in grade. City of Philadelphia *v.* Rudderow (Supreme Court of Pennsylvania) 31 At. Rep. 53.

Assessment for Change of Street Grade.—By the provisions of the statutes, an assessment for damages for a change of a street grade may be made in any city having power to change such grade by those officers who, under the city charter, make assessments for benefits arising from municipal improvements. When the change of grade is itself an improvement for which benefits may be assessed, or is a part of or an incident of such an improvement, the assessment for damages should be made at the same time, and as a part of the assessment for benefits. Stewart *v.* Mayor, etc., of City of Hoboken (Supreme Court of New Jersey), 31 At. Rep. 278.

Liability of Municipal Officers.—Municipal officers, will not, in the absence of malice or culpable negligence, be personally liable for damages caused by constructing a sewer across private premises under the authority of the city. Parks *v.* City Council of Greenville (Supreme Court of South Carolina), 21 S. E. Rep. 540.

Legal Expenses Not Chargeable to Street Assessments.—The expenses incurred in unsuccessfully defending suits brought against a borough, because of its illegal and negligent acts in executing a public improvement, can not be specially assessed as a part of the cost of such improvement. State *v.* Mayor, etc., of Borough of Rutherford (Supreme Court of New Jersey), 31 At. Rep. 228.

When Mandamus will not be Issued Against Municipal Officers.—The common council directed a committee to advertise for proposals for certain work, and to let it to the lowest bidder, and directed the mayor to execute the contract. After a party's proposal had been accepted, the council reconsidered its action, and indefinitely postponed the matter. The Supreme Court, 5th department, New York, held that a mandamus to compel the mayor to execute the contract would not lie, and that the remedy was an action against the city for damages. Ryan *v.* Aldridge, Mayor, 31 N. Y. S. Reporter, 920.

MACHINERY AND TRADE.

USE OF STEAM ROAD ROLLERS IN MAKING GOOD ROADS.

Mr. Alan McDougall, M. Can, S. C. E., writing of street and highway improvements in Canada, says that the macadam road has suffered from its rival, the cedar block, for many years. One ground of objection taken was the dusty and unhealthy condition of this class of roadway. "The experience gained from cedar-block streets," he says, "should set rate-payers thinking, and make them look into the wear and conditions of macadam surfaces before they condemn more of this class of roadway. With examples of well-rolled metalled (or macadam) surfaces on the streets of Montreal and Ottawa, and the experience of both cities directly favorable to the use of a steam road-roller, and also opportunities of seeing the same class of work in many places close by us, on the other side of the border, there should be no hesitation now in following the advice of the city engineer. Under existing circumstances the metalled streets are necessarily dirty, ill-conditioned, and fair samples of the 'awful example.' Under the treatment of a good steam road-roller, and a good, clean, hard-wearing material on the surface, these streets will rapidly rise in favor. Every year's maintenance will improve them, the material placed on them will compact the body of the surface; each year they will make a better return for the care bestowed upon them, whilst the lessened cost for repairs and renewals will make glad the heart and lighten the pocket of the rate-payer."

THE PERKINS SURFACE-HEATER FOR REPAIRING ASPHALT PAVEMENTS.

It is well known that pavements, like clothes, do not wear out "all over" at once, but in spots, where the wear is especially heavy, and if such places could be easily and perfectly repaired, the life of any pavement would be doubled, if not trebled. This was one of the advantages claimed for asphalt pavements, but as years rolled along, experience showed that such repairs were not as easily, cheaply or as well done in many instances as had been hoped, and that after they were made, on cold and hot days such patches showed depressions or elevations, and the originally smooth surface was made irregular. However, the United States Repair and Guaranty Co., of Chicago, has exhibited a method or process of repairing these pavements, together with apparatus, called the Perkins surface-heater (upon which they have obtained letters patent), which is believed to overcome the previous defects in making repairs, and so important has this invention become that many cities and most asphalt pavers of the country have adopted it without the public knowing about it.

This method consists in heating the asphalt surface at the place where any repair needs to be made, by means of the Perkins Surface Heater, a small machine on wheels which throws a flame right down on the pavement and in a very few minutes softens it so that it is in much the same condition as when laid. An ordinary hoe or rake is used to scrape off the indurated thin crust

formed by the direct contact with the flame. Exposing the live, mealy, heated asphalt in the same condition as when first laid, new material is then added, not too much nor too little, and the repair is completed by tamping and rolling to an even surface with the surrounding street and letting it cool. In an hour after the repair has been made and traffic resumed no one would know where the defect was, the repair being so perfect. There is no waste of material by this means; if a half inch of material is worn away only one half is replaced; if an inch or two inches is worn that amount is replaced and no more. If the asphalt is worn away for a considerable area for a quarter of an inch that quarter of an inch can be replaced without removing the balance of the pavement or injuring it. The defects in repairs under the old system caused by expansion and contraction are by this method obviated, as the heating of the surface to soften it causes it to expand so that when the fresh material is added the surface becomes homogeneous at once, and the old and new become acclimated, as it were, at once. The process is applicable alike to the repair of openings, cracks, depressions, and the resurfacing of an entire street. With the use of this invention it seems that asphalt pavements may be made to last indefinitely, with careful attention to repairs and an occasional resurfacing at long periods.

THE INTERNATIONAL SWEEPING MACHINE.

After several years of experimental work, Mr. E. L. Hawks, of the International Sweeping Machine Co., has perfected his sweeper to a degree that leads him to believe that he has solved the problem of street cleaning by machinery, and he is now putting his invention on the market. It has been received with much favor, and he has many testimonial letters of the strongest character from people who speak as experts. Many of the machines have been sold, and are now in use in leading cities of the United States. The machine is designed to be drawn by two horses, and is called a "picker-up." He claims for it the following points of superiority: cleaner sweeping; picks up dirt as it passes along; a reduction of over 25 per cent. in the cost of sweeping; creates no dust while it takes up all pulverized dirt; can be used in the daytime without annoying either people or horses; can be unloaded in the fraction of a minute. Rotating brooms are often criticised because by their centrifugal force they throw over a certain amount of dirt, which is deposited on the swept surface. The manufacturers of the International claim for it that there is no overthrow of sweepings by its progress, as this is intercepted in a box, which is dumped at the same time as the main receptacle.

The International sweeps a swath five feet wide. The broom revolves on a stationary spindle running through a tube in the center of the broom. The bearings are of Babbitt metal or brass, run in the ends of the tube four inches at each end, thereby creating a vacancy to the extent of the thickness of the bearings; this space is used as an oil chamber, is dust proof, and once filled does not require replenishing during the life of the broom. The brushes are filled with medium coarse bass, and are so constructed as to be easily replaced, the manufacturers claim, at a cost not greater than that of refilling those of old-

THE INTERNATIONAL SWEEPING MACHINE.

style machines using the same material. The brushes wear direct from the end of the fiber, and when worn out the remaining stubs look as though they had been cut off, in consequence of which it is claimed that they will wear about twice as long as usual. The principle on which the machine is built is to do by rotary speed what others do by pressure. Its rapidly revolving brush sweeps the dirt into an internal receptacle of the capacity of a cubic yard. When the receptacle is full the accumulated sweepings are dumped by simply throwing a lever, the load of dirt being emptied in from twenty to thirty seconds. The driver can, while in his seat, completely control the operations of the machine, putting or releasing the pressure on the pavement, raising or lowering it, and throwing it out of gear. The machine sweeps within about a foot of the curb. The gutter is cleaned by having a man push a hand-broom in front of him, and throwing the dirt away from the curb, so that it may be taken up by the machine as it comes along. The manufacturers state that contractors who have side sweepers which they think it will not pay to throw aside can use the International to advantage as a filler and keep their side sweepers till worn out.

The construction of the machine is almost entirely of steel and wrought iron, with malleable iron castings. Durability is aimed at throughout, as well as simplicity, so that repairs and renewals may be easily and cheaply made. The machine weighs about 2,500 pounds, which is necessary to give the proper traction, and is easily drawn by two horses. The machines are guaranteed by the manufacturers, and the sale of them is controlled by the International Sweeping Machine Company, of Dayton, Ohio.

TRADE NOTES.

Reinbeck, Iowa, has a new brick and tile factory.

Wellsville, Ohio, contemplates the purchase of a street sweeper.

The city of Stevens Point, Wis., has ordered an Aultman sweeper.

The City of Augusta, Ga., contemplates the purchase of new watering carts.

A large brick plant is being established at Lake Butler, Fla., by Frazier & Colson.

The city of Sacramento, Cal., contemplates the purchase of a steam road-roller.

A resolution, providing for the purchase of a new stone crusher, is being considered at Concord, N. H.

The town of Winchester, Ill., has voted to appropriate $3,500 for the purchase of a steam road-roller.

The Barber Asphalt Paving Company, of Buffalo, N. Y., will erect a refining asphalt factory at Toronto, Ont.

A stone crusher and engine has been purchased of the Climax Road Machine Company, for Hopkinton, R. I.

Wilmington, Del., purchased a new eight-ton road-roller of the O. S. Kelly Company, Springfield, O., for $3,500.

Cohoes, N. Y., has purchased a new street sweeper of the F. C. Austin Manufacturing Company, of Chicago.

The Charter Oak Brick Company has been organized at New Haven, Conn., with a capital stock of $25,000.

New Brunswick, N. J., has a new establishment for manufacturing paving blocks from the clay in that vicinity.

The Pitts Agricultural Works, Buffalo, N. Y., has sold a 15-ton steam road-roller to the city officers at Janesville, Wis.

The Warren-Scharf Asphalt Company has under consideration the advisability of erecting a stationary plant in Watertown, N. Y.

It is believed at Du Bois, Pa., that a plant for the manufacture of paving brick in that city, would prove a paying investment.

The North Plainfield council, Plainfield, N. J., passed a resolution, August 2, to purchase a road scraper, the cost not to exceed $120.

A steam road-roller has been rented of the Pitts Agricultural Works, of Buffalo, N. Y., for use on North Main street, at Bristol, Conn.

H. M. Stow has begun suit against the city of Chicago, claiming $3,000,000 damages for the use of his patent on cedar paving blocks.

The purchase of a stone crusher has been suggested at Seymour, Conn., to keep a quantity of broken stone in readiness for needed road repairs.

A brick manufacturing plant will be established at Antwerp, N. Y., with a capacity of 20,000 brick a day. The clay is the property of O. G. Devendorf.

The city of Wheeling, W. Va., has purchased a "Columbian" 36,000-pound steam road-roller, of the Enterprise Manufacturing Company, Columbiana, O.

Atchison, Kan., has received propositions for the purchase of a road machine, which matter has been placed in the hands of the committee on improvements. A. C. Trueblood, city clerk, will lay before the committee any propositions which may be made.

S. D. Trumbo, city clerk at Sedalia, Mo., has been instructed to procure prices on a new street sweeper. A cement testing machine will be purchased also.

The Wrought Iron Bridge Company, Canton, O., has a contract at Baltimore, Md., for lining eight cells at the Towson jail with steel three-eighths of an inch thick.

A new method of manufacturing tapered pipe has been invented by Samuel Leek, of McKeesport, Pa., and a company is being organized for the erection of a plant to make the new pipe.

The Garfield Brick Works have been purchased by T. J. Robinson, J. W. Robinson and W. I. Robinson, of Bolivar, Pa. The new firm will be known as the Garfield Fire Clay Company.

The stockholders of the California Sewer Pipe Company, Los Angeles, Cal., held a meeting August 10th, and decided to reduce the capital stock of the company from $750,000 to $115,200.

The common council, Amsterdam, N. Y., has decided to purchase a Pitts road-roller, manufactured by the Pitts Agricultural Company, of Buffalo, N. Y., provided it proves satisfactory after a trial of thirty days.

The plant of the Pioneer Paving Brick Company, Galesburg, Ill., has been put in operation again. Aside from the need of a new kiln, the machinery is in good order and capable of turning out one million brick per month.

A certificate of incorporation has been filed by the Metropolitan Asphalt Paving Company, New York city. The directors are: Thomas H. Thomas, Paul D. Cravath, John W. Houston, Edward H. Brush and Wm. H. Coleman.

The board of directors of the Buena Vista Fire-Clay Company held a meeting at Lynchburg, Va., recently to consider the question of ways and means for resuming work. The plant is in good shape and practically out of debt.

The Brooklyn Alcatraz Asphalt Company has been organized, at Brooklyn, N. Y., with a capital stock of $50,000. The incorporators are : Wm. B. Pope, New York City; Harry C. Iverdell, Thaddeus D. Bradford, David K. C. Clase, and C. W. Wild, of Brooklyn.

The Enterprise Manufacturing Company, Columbiana, O., has made recent sales, as follows: A 30,000-pound steam road-roller, to Spence Bros., Fairmount, East Cleveland, O.; a 25,000-pound steam road-roller, to Thomas F. Reilly & Co., of West Philadelphia, Pa.

The Brush and City of Austin Sewerage Company's sewer systems were sold at receiver's sale, August 6, at Austin, Texas. J. J. Donovan, Lowell, Mass., purchased them for $15,000. The systems have been involved in litigation for several years, which is finally adjusted by this sale.

Incorporated: New Castle Asphalt Block Co., Pittsburg, Pa.; Callanan Road Improvement Co., Albany, N. Y.; Lindenwood Brick and Quarry Co., St. Louis, Mo.; Metropolitan Asphalt Paving Co., New York City; Oelwein Pressed Brick Co., Oelwein, Iowa; Brooklyn Alcatraz Co., Brooklyn, N. Y.; Sanders Brick Co., St. Louis, Mo.

A test has been made by the Purington Paving Brick Company, Galesburg, Ill., of the clay on the J. K. Caldwell property, near Menominee, Wis., which demonstrates the excellent quality of the material for paving brick. Every test made of the clay has been favorable. W. S. Purington, in a letter to Mr. Caldwell, said: "Have kept one-half of one brick, as I think it about as fine a paving brick as I ever saw. I placed the broken brick in water for 24 hours, and it weighed 5 pounds 15¾ ounces and when taken out weighed less than 6 pounds, showing a wonderful record."

A company has been organized at Tampa, Fla., for the purpose of extensively manufacturing the new patented process of cement brick. The officers of the company are: President, Syd. B. Sturdivant; vice-president, David L. Ferguson; secretary, and manager, David S. Williams; treasurer, M. E. Gillette. Machinery will be put in as rapidly as possible for manufacturing about 10,000 brick per day.

J. T. Wyatt, Faith, N. C., writes that the outlook for business in that locality is better than it has ever been before. Orders have been received for more than 60,000 feet of granite curbing for street purposes. Mr. Wyatt is opening up a pink granite quarry, and the granite is being shipped as fast as the cars can be loaded. The granite belt is fifteen or twenty miles long and between one and two miles wide.

The stockholders of the Morgan County (Ala.), Asphalt and Oil Co., elected officers August 10th, at Hartselle, Ala., as follows: President, Major Sam Blackwell, Washington, D. C.; secretary, J. Asa Rountree; general manager, Dr. D. W. Day; directors, Maj. Sam Blackwell, Washington, D. C.; S. A. Cunningham, Nashville, Dr. D. W. Day, S. L. Rountree, J. Asa Rountree, Hartselle, Ala. The company is maturing plans for the development of the asphalt and oil resources of Morgan county.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Sherman-ave. is being paved with asphalt at Omaha, Neb.

Newark, N. J., will lay $1,000,000 of pavements this year and next.

Willow Grove-ave. is being macadamized at a cost of $7,000 at Germantown, Pa.

More than two miles of brick streets will be constructed in Evansville, Ind.

Nearly two million paving blocks and bricks will be used at Wilmington, Del., this season.

About thirty-two miles of macadam pavements have been constructed in New Bedford, Mass.

Greensburg, Pa., is interested in the kind of paving that would be best in the streets having steep grades.

Saginaw, Mich., is interested in a rectangular sapless cedar block for paving, which is new to that city.

Bids were rejected Aug. 5 for paving eight blocks of streets at Quincy, Ill., and the work will be done by the city.

St. Paul, Minn., has five miles of asphalt paving. The street improvements for the year 1895 will amount to $450,000.

The board of public works at Newark, N. J., has practically declared itself in favor of doing some vitrified brick paving.

The property-owners on Front-st., Mankato, Minn., are opposed to macadamizing the street this year, but have voted to curb and gutter it.

The Barber asphalt paving company began the work of paving Yonkers-ave., from Nepperhan-ave. to Walnut-st., Yonkers, N. Y., Aug. 14.

The Warren-Scharf asphalt paving company began the work of completing the asphaltic pavement on the Square at Watertown, N. Y., Aug. 12.

The common council at New Bedford, Mass., refused to alter an appropriation for an asphaltic pavement in Pleasant-st., between Union and Kempton.

The street committee at Newark, O., has recommended that N. Fourth-st., from Locust to Sibyl creek, be paved with the Harris block macadam manufactured at Zanesville, O.

Brick pavements are being laid at Wilmington, Del., in Tenth, King, Third and Seventh-sts.; granite blocks on Eleventh-st.; macadam on Lincoln-st., and rubble-stone on Fourteenth-st.

Chert as a paving material will be tested in Pensacola, Fla. The highest satisfaction is felt in Birmingham, where 240 miles of streets have been paved with it, and in Montgomery.

City Engineer Chatten, Quincy, Ill., estimates the cost of paving Vermont, Seventh and Fifth-sts., if done under a competent superintendent, at 95 cents a square yard for laying the brick. The rest of the work would be done under contract.

The street and water commissioners of Jersey City, N. J., visited Philadelphia Aug. 14 to inspect the brick pavements before awarding contracts for that kind of material in their own city.

A movement has been started by the people in the vicinity of Pittsburg, Pa., in favor of composite roads, consisting of a macadamized track twelve feet wide with a dirt road alongside of it.

The West End improvement association, Rochester, N. Y., is opposed to wooden blocks. Stone and cement will probably be substituted hereafter when it becomes necessary to relay walks.

The street committee at Port Hope, Ont., is making an experiment on Queen-st. with cement paving, which will probably, if it proves successful, replace the plank pavements in the main streets.

The Robert J. Boyd Paving and Construction campany will begin paving the new addition to the stock yards at Kansas City, Kas., about Sept. 1. About 100,000 square yards of brick pavement will be put in.

The street paving ordinance providing for the paving of Union-st., at Burlington, N. J., has been rendered ineffective because it ordered work done that has been provided for in previous ordinances. The ordinance will be reconsidered.

City Engineer Schenck of Troy, N. Y., has a scheme which he will recommend to the city officers for covering some of the blocks now paved with granite and Belgian blocks with asphalt. The method has been successfully tried in Brooklyn and elsewhere and the lowest cost is but 63 cents per square yard.

Paving blocks are made at Norfolk, Va., of grass growing in salt water sea marshes. The grass is subjected to heavy pressure, then cut into blocks and submerged in oils, which makes the fiber supple. They have stood the test of more than a year remarkably well, and large contracts have been made for supplying them.

As an experiment in paving, the Main-st. Alachua rock paving, Jacksonville, Fla., will be covered with shells obtained at De Leon springs. The shells are innumerable in the vicinity of De Leon springs and are mined like phosphate. They are mixed with a fine soil like gravel. They are being used in De Land, Fla., with entire satisfaction.

Under the supervision of Highway Commissioner McCloskey one of the largest street improvements ever undertaken in Harrisburg, Pa., has been recently completed. It was the macadamizing of Front-st., from Washington to North. About 1,500 perches of all sizes of broken stone were required, and the entire street was spiked up by the road roller, the earth removed and a layer of small broken stone put on and rolled.

More granolithic pavement will be put down this year in Washington, D. C., than in any previous year. The pavement will not be so wide as those laid heretofore. It has been decided that this is the pavement for Washington in the future, and whenever it is found necessary to renew paving it will be substituted for the old brick pavements. The commissioners expect to put down 50,000 square yards this year.

The annual report of the commissioners of the District of Columbia shows that at the last contract letting the lowest bids for asphalt on four-inch and six-inch concrete bases were $1.53 and $1.68 per square yard; sheet asphalt on cobble or macadam base, $1.55 per square yard; asphalt block on gravel and concrete, $1.78 and $2.25 respectively. The prices are considerably less than the low prices of the previous year, and have been brought about by competition.

A serious impediment to street paving in St. Augustine, Fla., is caused by the stand recently taken by a number of the city's largest tax-payers, who maintained that it was the city's duty to pave and keep the streets in good condition out of the taxes they paid. When informed that the general taxes could not be used to pay more than the authorized one-third of the roadway, these tax-payers said that they would not agree to the requirements of the law and that the city must do all of the paving.

Tne proposition of the Flint brick company of Des Moines, Ia., to lay a vitrified brick pavement on Washington-ave., between Second and Third-aves., Minneapolis, Minn., has been accepted by the city council. The foundation will be six inches of concrete, and if the pavement proves satisfactory after a trial of two years the city will pay for it at a rate not to exceed $1.90 per square yard, and if it is not accepted at the expiration of two years the company will not receive compensation. The pavement will be completed by Oct. 1, 1895.

An experiment is being made by City Engineer Filley, at Kansas City, Mo., from which he expects to realize satisfactory results. The great trouble of brick paving has been the chipping of its edges and a consequent rough and uneven street. Instead of ordinary sand the pavement is flushed with a preparation of sand and Portland cement, which fills the interstices between the bricks, hardens and gives them a solid brace, which, it is believed, will prevent the rounding off of the edges. The preparation costs 12 cents a yard. The plan has been tried in the East with satisfactory results.

A temporary restraining order, issued from the superior court upon the complaint of a property-owner, who alleges that the proceedings upon which the work will be done and the assessment ultimately levied are irregular and void, will delay the paving of Main-st., at Los Angeles, Cal. As filed, the complaint calls everything into question except the constitutionality of the bond act, and as the supreme court has shown a disposition to avoid, if possible, giving any decision on this point it is thus left open to test the bond question upon a separate proceeding in which no other issue will be involved outside of the value of street improvement bonds as a lien on property. The decision is looked to with interest, as it will be of the greatest benefit to city property-owners in the state.

CONTEMPLATED WORK.

Paving is contemplated for Lawn and Searle-sts., Pittston, Pa.

A Telford pavement is contemplated at Greenwich, N. Y., Arch-st.

The new W. Main-st. bridge, Belleville, Ill., will be paved with vitrified brick.

An asphaltic pavement is being considered for Maiden-lane, Kingston, N. Y.

The residents of Atglen, Pa., are agitating the matter of street improvement.

The road from Pawcatuck to Stonington, R. I., will be macadamized at once.

Bids will be asked early in September for section No. 2 of the subway, Boston, Mass.

Ferry and Liberty-sts., Schenectady, N. Y., will be paved with Trinidad pitch lake asphalt.

A mile of macadamized road will be built from Elmville bridge toward Danielson, Conn.

Front-st., from Court to Porter-ave., Buffalo, N. Y., has been ordered paved with asphalt.

Ordinances have been passed at Camden, N. J., for paving with rubble a number of streets.

Resolutions are in the council at Toledo, O., for paving Twenty-second-st. and Ontario-st.

Pleasant-st., from Union to Kempton, New Bedford, Mass., will probably be paved with asphalt.

New sidewalks of artificial stone and concrete have been ordered constructed in New Haven, Conn.

An ordinance has passed third reading at Erie, Pa., for brick paving for Tenth-st., from Parade to East-ave.

The councils of Williamsport, Pa., have passed an ordinance for repairing Pine-st. with vitrified brick.

Resolutions were adopted July 30 at Kansas City, Kas., for paving and curbing Bunker and Park-aves.

Resolutions have been passed at Cleveland, O., for asphaltic paving on Lake, Hamilton and Ontario-sts.

The Good Roads association of Almeda county, California, made an appeal for good roads in Oakland July 29.

Plans and specifications have been prepared for paving Fifth-st., from Cherry to Vandalia, at Terre Haute, Ind.

The ordinance for paving Roseville-ave., Newark, N. J., with vitrified brick has passed a third reading in the council.

About fifteen miles of streets will be paved at Peoria, Ill., next year. Asphalt seems to be the preferred pavement.

A vitrified brick pavement is contemplated for the Wade-ave. extension in E. Washington borough, Washington, Pa.

A resolution has been passed at Kansas City, Mo., for paving with Trinidad lake asphalt Eleventh-st., from Main to Summit.

A petition has been circulated for an asphaltic pavement on Stone-st., between Washington and Benedict, Watertown, N. Y.

Jefferson-st., from Delaware-ave. to Dove-st., Albany., N. Y., will be paved with brick. Beaver-st. will be paved with granite.

The common council at Waterbury, Conn., has voted to construct vitrified brick pavements as the result of an investigation.

The common council, Brooklyn, N. Y., has declared its intention of repaving State-st., from Clinton to Flatbush-ave. with asphalt.

The property-owners on Genesee-ave., Saginaw, Mich., will make another effort for a pavement of some kind for the street this year.

The property-owners on Brady-st. and Long Island-ave., Dubois, Pa., have signified their willingness to bear the cost of paving with brick.

Asphaltic pavement has been recommended for Grand-ave. and Fourth and Sixth-sts., Kansas City, Mo., and macadam for Fifteenth-st.

Cleveland, O., contemplates the construction of a boulevard parallel to Euclid-ave. It is also intended to relieve the traffic on Euclid-ave.

A petition has been presented to the board of public works at Denver, Col., asking for an asphaltic pavement on Fifteenth-st., from Larimer to Platte.

Under the provisions of the new good road law Main-st., E. Hartford, Conn., will be macadamized. An appropriation of $3,000 has been made for the purpose.

The city council of Rosedale, Kas., has voted to expend $700 in paving Kansas City-ave. A resolution has also been passed to pave Main-st. with vitrified brick.

The property-owners on Washington-st., Grand Rapids, Mich., decided recently to ask the council to improve the street with asphalt, but not to do it before next March.

New pavements voted for by the aldermen at Brooklyn, N. Y., before adjourning until Sept. 10, are: Granite block, DeKalb, Tompkins and Park-aves. and Bergen-st.

Legislation in Toledo, O., provides for the paving of South-st., from Broadway to Hiatt-ave. Petitions have also been presented for paving Oakwood-ave. and Ontario-st.

The residents of Wood-st., Youngstown, O., have presented a petition to the city commissioners asking for an asphaltic pavement on their street, from Wick-ave. to Elm-st.

Final action has been taken at Indianapolis, Ind., for paving as follows: Asphalt, Market-st., from Alabama to East; brick, Kentucky-ave., from River-ave. to Merrill-st.

Ordinances for paving E. Main-st. to the old city line, and for paving Main-st., from the Erie road to E. Main-st., have been referred to the street committee at Bradford, Pa.

Burnside-st., from Third-st. west to the intersection of Washington-st., Portland, Ore., will be paved with asphalt on a concrete foundation. A slight irregularity occurred in the publication of the former intention and the common council ordered the notice republished in order to pave the way for bids to be offered.

The board of public works, Denver, Col., has received petitions asking for the paving of Court-place, lower Fifteenth-st. and Palmer-ave. Several other petitions are about ready to be presented.

The following paved streets have been accepted at San Francisco, Cal.: Basalt, Broadway and Lyon-sts.; bitumen, Capp, Park-lane south, Waller-ave. and Harrison-st.; cobbles, Waller, between Broderick and Buena Vista-ave.

The residents of Franklin-st., Wausau, Wis., have presented a petition to council asking that the street be made into a boulevard. A cedar block pavement will probably be constructed as it is believed that asphalt will cost too much.

The property-owners of the Fourteenth, Fifteenth, Sixteenth and Seventeenth wards, Brooklyn, N. Y., have requested the paving of Leonard-st., from Greenpoint-ave. to Broadway, with asphalt at an expense of $76,000 to be borne by the city.

Street Commissioner Milner, St. Louis, Mo., has announced his intention of condemning eight miles of asphalt and wood paved streets, and ordering them resurfaced. The wood block pavement will be replaced with asphalt, vitrified brick or telford.

Petitions have been presented to the council, New Haven, Conn., for a vitrified brick pavement on Ashmun-st., from York to Gregory; York-st., from Ashmun to Elm; sheet asphalt, W. Chapel-st., from York to Nott; Orange, from Crown to Canner.

Stone, or some other suitable paving material, will be considered for paving the centers of South and Court-sts. at Norfolk, Va. The street committee has also asked to be allowed to sell $4,000 worth of paving bonds to complete paving First-st.

The park board, New York City, asked recently for an appropriation of $67,500 to macadamize the roads in Pelham Bay park. It also asked for permission to pave Fifth-ave., from Ninetieth to One Hundred and Tenth-st., with asphalt instead of granite blocks.

Brick paving will be laid on Philip-st., from Huckson to Myrtle-ave., and Swan-st., from Chestnut to Elm, at Albany, N. Y. If the contemplated sewer construction can be completed in time, bids may be asked for paving Central-ave. with brick this fall.

Alpena county, Michigan, contemplates macadamizing the county roads. One stone crusher will be required and one or more road rollers of about seven tons weight. For particulars address Mr. Avory, Chairman, Alpena county stone road committee, Alpena, Mich.

Resolutions have been adopted at Cleveland, O., for paving as follows: Medina block stone, Luceil-st., from Euclid-ave. to Mayfield-st.; asphalt, Wood-st., from St. Clair to Summit; repaving with Trinidad lake asphalt, Case-place; brick, Knox-st., from Cornell to Mayfield.

A special town meeting was held at Stafford, Conn., Aug. 12, for the purpose of ascertaining if the town would take action in the proposed highway improvement. An appropriation of $3,000 was voted for a section of macadamized road, beginning at the town hall in Stafford

Hollow and extending northerly toward Staffordsville.

Resolutions were adopted at Brooklyn, N. Y., Aug. 12, authorizing paving as follows: Asphalt, Tompkins-ave., from Flushing-ave. to Fulton-st., estimated cost $60,000; granite, Bergen-st., from Court-st. to Fourth-ave., $19,000; granite, Park-ave., from Hudson-ave. to Broadway, $113,000; granite, DeKalb-ave., from Fulton-st. to Broadway, $174,000.

CONTRACTS TO BE LET.

Bids will be received until Sept. 2, at Muncie, Ind., for improving sundry alleys. Check $50 each.

Sealed proposals will be received until Sept. 5, at Omaha, Neb., for grading. Certified check, $25.

Bids will be received until Sept 12, at Mankato, Minn., for improving the sand road in the town of Lime.

Sealed proposals will be received until Sept 3 at Cromwell, Conn., for constructing a section of Telford roadway.

Sealed proposals will be received until Sept. 6 at Brazil, Ind., for improving Washington and Cruzane-sts. Bond, $500.

Sealed proposals will be received until Sept. 13, at Defiance, O., for improving Clinton-st., from Fifth-st. to the Maumee bridge.

Bids will be received until Sept. 4 at Bluffton, Ind., for the construction of vitrified brick, stone, cement or board sidewalks.

Sealed proposals will be received until Sept. 4 at Brooklyn, N. Y., for repairing with vitrified brick McDonough and Nevins-sts.

Sealed proposals will be received until Sept. 5 at Cincinnati, O., for paving with brick and curbing Bard alley; granite, County alley.

Sealed proposals will be received until Sept. 7, at Decatur, Ind., for the construction of a brick sidewalk on the west side of Mercer-st.

Sealed bids will be received until Sept. 2 at Canton, O., for grading and curbing on each side of Brown-ave., from Linden-ave. to Second-st.

Sealed proposals will be received until Sept. 9, at South Bend, Ind., for paving with cement the sidewalks in E. Wayne-st. and Colfax-ave.

Sealed proposals will be received until Sept. 5 at Brooklyn, N. Y., for repairing Sixth-ave. and Second-st. with asphalt. Deposit, $550 each.

Bids will be received until Sept. 5, at Cincinnati, O., for repairing artificial stone sidewalks in the eastern and western districts of the city.

Sealed proposals will be received until Sept. 9 at Wabash, Ind., for macadamizing the roadway and paving the sidewalks in Bond and Ewing-sts.

Sealed proposals will be received at Orange, N. J., until Sept. 2 for macadamizing the roadway of Wallace-st., paving the gutters and curbing the sidewalks.

Sealed proposals will be received until Sept. 3, at Indianapolis, for curbing and grading Jefferson-ave. Check, $100; cement walks on Jefferson-ave. Check, $100.

Sealed proposals will be received until Sept. 3 at Syracuse, N. Y., for paving Water, Warren and Genesee-sts. with asphalt, vitrified brick or sandstone block.

Sealed proposals will be received until Sept. 9 for paving with cement the sidewalks and alley crossings on Michigan-st., from Tibbs to Belmont-ave., Haughville, Ind.

Sealed proposals will be received until Sept. 2, at Charles City, Ia., for grading, curbing, guttering and macadamizing Clark and Kelly-sts., from Main to Jackson. Check, $200.

Sealed proposals will be received at Williamsport, Ind., until Sept. 13 for graveling the roadway and constructing a gutter and concrete sidewalk on the west side of McClaflin-st.

Sealed proposals will be received at the office of the board of education, City hall, Cincinnati, until Sept. 9 for paving with brick the yard of the Windsor-st. school house. Guarantee, $500.

Sealed proposals will be received until Sept. 16 at Huntingburgb, Ind., for paving with brick the sidewalks in Walnut, Clay, Race, Vanburen, Jackson, Jefferson, Blemker and Clinton-sts.

Sealed proposals will be received at Indianapolis, Ind., until Sept. 5 for cement sidewalks in Randolph and Alabama-sts. Check, $100. Grading and graveling first alley west of Hall-place. Check, $100.

Sealed proposals will be received until Sept. 2 at Atchison, Kas., for paving with vitrified brick and curbing Riley-st. between N. Fourth and N. Fifth-aves. Certified check 10 per cent. of amount of bid.

Sealed proposals will be received at Clifton, O., until Sept. 7 for the improvement of Green Hill-ave. A separate contract will be made for the construction of cement curbs and gutters, with surface water inlets.

Bids will be received about Sept. 7 for 13,000 square yards of brick pavement, on crushed stone and gravel foundation, with stone or concrete curbing, at DeKalb, Ill. L. B. Merriam, Dixon, Ill., is consulting engineer.

Sealed proposals will be received at Huntington, Ind., until Sept. 16, for the construction of stone, vitrified brick, or concrete sidewalks five feet wide, on Salamonic-ave., Wayne-st., and Etna-ave. Certified check, $100 each.

Sealed proposals will be received by William H. Krapp, at the office of Charles A. Ewing, room 36, Carlisle building, Cincinnati, until Sept. 11 for improving Bevis, Florida and Floral-aves., Evanston, O. A certified check for $500 must accompany each bid.

Sealed proposals will be received until Sept. 9 at Montgomery, Ala., for paving S. Court-st., from Church to South., with vitrified brick. A separate proposal will be received for paving the sidewalks of the same street with Schillinger pavement.

Sealed proposals will be received at Jacksonville, Fla., until Sept. 10 for furnishing f. o. b. 3,920 square yards, more or less, of vitrified brick with which to pave Market-st., from Bay to Duval. Also for laying 3,920 square yards, more or less, of vitrified brick on Market-st., from Bay to Duval. Six samples of brick to be submitted, together with certified check for $1,000.

Bids will be received by Robert T. Hutton until Sept. 2, at the office of J. M. Harper, corner Ninth and Plum-sts., Cincinnati, for paving with brick or macadamizing, and constructing limestone curb and gutter, or concrete combined curb and gutter, Glos-ave., in Pleasant Ridge, O. Guarantee, $1,000.

Sealed proposals will be received until Sept. 2, at Logansport, Ind., for furnishing materials and paving Fifth-st., from Market to Broadway, with brick or blocks on concrete and broken stone foundation, and curbing with best Oolitic limestone, Medina stone or North river bluestone curbing. Bond required.

CONTRACTS AWARDED.

Kinnear & Graham, Columbus, O., secured a $75,000 paving contract in Loraine, O.

Mahoney Bros. secured the contract for paving a portion of S. Main-st. at Jamestown, N. Y.

Warren & Malley secured the contract for macadamizing and curbing Webster-st., San Francisco, Cal.

The city of Taunton, Mass., has taken a contract for building about a mile of state road on Winthrop-st.

The contract for paving Cherry alley, Washington, Pa., was awarded to Pickett Bros. at $1.39 per square yard.

J. C. McSpadden secured a contract for paving a street with brick at Johnstown, Pa., at $1.20 per square yard.

The contract for paving Main-st. with brick, at Walden, N. Y., has been awarded to Costello & Neagle of Elmira, N. Y.

The Talbot paving company, Detroit, Mich., secured the contract for paving Kirby-ave. in that city for $12,343.24.

The contract for paving Stiles and Cherry-sts., Elizabeth, N. J., has been awarded to Robert Wilson of that city.

The bid of the Warren-Scharf company, $2.66 per square yard, was accepted for paving Chenaugo-st., Binghampton, N. Y.

The commission of public works, Hudson, N. Y., awarded the contract for paving Union-st. to Shute & Rightmyer for $2,925.

The contract for section 2 of the Maple-st. pavement, Rochester, N. Y., has been awarded to the Rock asphalt company for $17,390.

The Warren-Scharf paving company secured the contract for an asphalt pavement on Mortimer-st., Rochester, N. Y., for $17,293.40.

The contract for paving Front-st. with brick, at Seattle, Wash., was awarded to Spurr & Wilmot at $2.25 per square yard, or total $30,208.

The contract for paving Baum-st., from Tuscola-st. to Germania-ave., Saginaw, Mich., was awarded to Scanlon & Crowley for $4,345.10.

The contract for paving Pacific-ave. with fir blocks on a concrete foundation, Tacoma, Wash., was awarded to Antone Berens for $41,422.

The contract for paving Payne-ave., North Tonawanda, N. Y., was awarded to Thomas J. Tulley at $1.86. Mack pressed brick will be used.

The contract for furnishing 200,000 granite paving blocks, Lowell, Mass., was awarded to C. A. Bailey of Suncook, N. H., at $39 per thousand.

The contract for macadamizing Geneseeave. from the F. & M. P. belt line to the city line, at Saginaw, Mich., was awarded to A. L. Sager for $1,910.25.

The contract for constructing cement sidewalks on Cleves-ave., Cleves, O., was awarded to the Mineral Plaster company at 60 cents per lineal foot.

Costello & Neagle, Elmira, N. Y., have the contract for paving the four corners on Main-st. with vitrified brick, at $2.15 per square yard, at Penn Yan, N. Y.

William Forrestal was awarded the contract for paving with brick Mason-st., between E. Water and Milwaukee-sts., Milwaukee, Wis., at $1.40 per square yard.

S. J. Wagoner was awarded the contract, at Rochester, N. Y., for laying cement walks in West-ave., and William Dyer & Co. for cement walks in Lewis-st.

The Warren-Scharf asphalt company secured the contract for paving with asphalt W. Fifth-st., from Wabasha to W. Third-st., St. Paul, Minn., at $2.13 per square yard.

The common council at Utica, N. Y., has awarded to the Warren-Scharf paving company the contract for paving Blandina-st. for $3,704, and Third-ave. for $8,318.35.

The Montclair quarry company, Montclair, N. J., was awarded the contract for building seven miles of macadam road in Morristown, Madison and Whippany, N. J.

The contracts for macadamizing the East Norwich turnpike and Hoffman boulevard, East Norwich, N. Y., were awarded to Twombley & Eldert of Jamaica, N. Y.

The Minerva paving brick company was awarded the contract for furnishing 333,000 vitrified paving brick for the use of the bureau of highways and sewers, Allegheny, Pa.

The board of public works at Indianapolis, Ind., awarded the contract for macadamizing Capitol-ave., from Indiana-ave. to Twelfth-st., to the Indiana Bermudez company.

V. D. Eichenlaub of Lancaster, Pa., was awarded the contract for 11,000 square yards of brick paving on Pittsburg-st., New Castle, Pa., for $11,045.61. Park brick will be used.

James White of Greensburg, Pa., has been awarded the contract for paving Clay-ave. with vitrified brick at Jeannette, Pa. The distance to be paved is about 7,000 yards.

William H. Barnes, city engineer at Topeka, Kas., writes that the contract for constructing 300,000 feet of brick sidewalk was awarded Aug. 9 to O. Swanson at $5.55 per foot.

The Edward & Walsh construction company, Davenport, Ia., was awarded the contracts for brick paving in the five new paving districts in Canton, Ill., at $1.11 per square yard.

The contract for paving Grand-ave., Milwaukee, Wis., has been awarded as follows: From Thirteenth to Twenty-first-st., Warren-Scharf asphalt paving company, $2.01 per square yard; from Twenty-first to Twenty-seventh, Western paving and supply company, $1.99 per square yard.

Paving contracts were awarded at Fargo, N. D., as follows: Broadway, McDonald & ONeill, $16,088.36; Front, McDonald & O'Neill, $21,282.20; H. P.-ave., James Snyder, $15,838.73.

The Warren-Scharf asphalt paving company was awarded the contracts for paving Jefferson and Crescent-aves., Peoria, Ill., at $68,509.89 for Jefferson-ave. and $2,252.11 for Crescent-ave.

Contracts for vitrified brick paving have been awarded at Louisville, Ky., as follows: Catalpa, Dumesent and Twenty-eighth-sts., J. R. Gleason; Twenty-second-st., R. L. Clark; Oak-st., E. L. Colston.

The contract for paving Story-st., between Sixth and Seventh, Boone, Ia., was awarded to J. L. Black & Co. of Omaha, Neb., whose bid was: Paving, $1.31; cement curbing, 38 cents; stone curbing, 80 cents.

The Warren-Scharf asphalt paving company was awarded the contract for laying asphaltic pavements on Arcade, Arsenal, Mill and Franklin-sts., at Watertown, N. Y., at $2.52 per square yard, Aug. 15.

Grady, Carroll & O'Connor of Marion, O., secured the contract for macadamizing Marion-st., Cardington, O., for $6,411.13. A petition has since been presented the council asking that the street be paved instead of macadamized.

Thomas Harrington, Jersey City, N. J., was awarded the contract at Middletown, N. Y., for paving E. Main-st., from Franklin square to the Erie tracks, with brick at $1.87 per square yard. Catskill shale brick will be used.

John J. Cummins secured asphaltic paving contracts in New York City Aug. 22 at prices ranging from $3.06 to $3.18 per square yard. The streets to be paved are Park, Baxter, Mott, Hester, Bayard, Franklin, Spring and Clark-sts.

The contract for paving State-st., from Main to Commerce and American and Central rows, with block asphalt, at Hartford, Conn., has been awarded to the Hartford paving and construction company at $3.04 per square yard.

Bids received in Brooklyn, N. Y., Aug. 7, for asphaltic pavement on Bainbridge, McDonough and Madison-sts., ranged from $1.38 to $1.49 per square yard. A year ago they ranged from $1..35 to $1.44, and previous to that from $2 to $2.25.

Contracts have been awarded at Chicago, Ill., for paving sundry streets and alleys with wood at an average cost of 97 cents per square yard. About twenty contracts, ranging from $1,000 to $5,000 each, were awarded to eleven different firms.

The Fruin-Bambrick construction company of St. Louis, Mo., secured five contracts for asphaltic paving in New York City, Aug. 6. The bids ranged from $3.30 to $3.50 per square yard and are from ten to fifty cents lower than the other bids submitted.

The street committee of Camden City, N. J., awarded the contract for paving Pine-st., from Seventh-st. to the Camden & Atlantic railroad with rubble, to Aaron Ward at 73 cents per square yard; paving Eighth-st., from Cooper to Penn, with Belgian blocks, Aaron Ward, $1.52 per square yard.

The contract has been awarded at Louisville, Ky., for paving Fulton-st., from First to Jackson, with granite blocks. Owen Tyler, J. M. N. Needham and Bob Clark secured the contract at an average price of $30 a square of ten feet. Contracts for paving in Parkland were awarded to John R. Gleason and R. L. Colston.

The road committee, Montreal, Canada, has recommended that Bastien and Valiquette be awarded the contract for paving St. Denis-st., between Duluth and Mt. Royal-aves., for $66,616, and the contract for Notre Dame-st., between Chaboillez square and the city limits, to the Sicily asphaltum company for $115,367.

Paving contracts have been awarded at Detroit, Mich., as follows: Repaving Joseph Campau-ave., James Grant, $4,199.99; Warren-ave., from Grand River-ave. to Fourteenth-ave., brick on concrete, Lennane Bros., $2,571.99; Witherill-st., from Miami-ave. to Adams-st., brick on concrete, Laidlaw Bros., $419.29.

Paving contracts were awarded July 30, at Jersey City, N. J., as follows: Asphalt over present cobble-stones on Coles and Varick-sts., Barber asphalt paving company, $28,827; repairing a number of streets with new Belgian blocks, John Nolan, $1.24 per square yard; relaying Belgian block pavements, John Nolan, 29 cents per square yard.

Bids for paving Main and High-sts. with asphalt block were received at Hamilton, O., Aug. 20. An injunction suit against the High-st. paving prevents the awarding of the contract. The bids were: High-st., W. H. Louthan, $2.73 per square yard; Bartow & Clements, $2.65; Main-st., W. H. Louthan, $2.73; Bartow & Clements, $2.60; E. A. Hicks, $2.76; Edward Ryan, $2.73.

Contracts have been awarded at Newark, N. J., as follows: Paving Washington-st., from Central-ave. to Market-st., granite blocks on concrete, John F. Shanley, $2.84 per square yard; Wright-st., from Broad to Clinton-ave., asphalt, Barber asphalt company, $2.69 per square yard; Clifton-ave., from Fifth to Bloomfield-ave., asphalt, Barber asphalt company, $2.70 per square yard.

The Metropolitan asphalt paving company has secured paving contracts in New York City as follows: Allen-st., from Division to Houston, $3.50 per square yard; Chrystie, from Grand to Houston, $3.63; Clinton, from Division to Houston, $3.99; Orchard, from Division to Houston, $3.65. The only competing company was the Warren-Scharf company, whose bid on each street was respectively $3.78, $4.08, $4.01 and $3.99.

Paving contracts were awarded Aug. 19 at Albany, N. Y., as follows: Chestnut-st., vitrified brick, T. Henry Dumary, $17,678.80; Spring-st., brick, T. H. Dumary, paving $1.89 per square yard, curbing 70 cents, flagstone sidewalk 20 cents; N. Pearl-st., granite block, T. H. Dumary, paving $2.76, curbing 70 cents, cross walk 15 cents, concrete foundation $1.30 per square yard; Third-ave., granite, H. J. Vandenburg, paving $2.91, curbing 75 cents, circular curbing 80 cents, cross walks, 20 cents.

The board of works awarded contracts at Newark, N. J., Aug. 15, as follows: Paving Belmont-ave., from Springfield to Avon, with granite on sand, T. J. Regan, $53,355; Belmont-ave., from Avon to Clinton, asphalt, Barber asphalt paving company, $2.70 per square yard; Lafayette-st., asphalt, New Jersey asphalt paving company, $2.68 per square yard; Bruce-st., asphalt, Barber asphalt paving company, $2.65 per square yard; Boyd-st., oblong trap rock blocks on concrete, John F. Shanley, $17,426.

The board of public works, Indianapolis, Ind., has awarded paving contracts as follows: Asphalt, Mississippi-st., from First to Seventh, Indiana Bermudez company, $4.70 a foot, each side; from Ohio-st. to Indiana-ave., Western paving & supply company, $6.18 a foot, each side; from Indiana-ave. to First-st., Western paving & supply company, $5.75 a foot, each side. The contract for paving Central-ave. with red cedar blocks was awarded to Browder & Shover at $5.50 per lineal foot, each side; for asphalt, on Tenth-st., from Talbott to Central-ave., Warren-Scharf company, $3.79.

SEWERS.

Visalia, Cal., will have a complete sewerage system.

The estimated cost of a sewer to carry the water from Dry Run to Cedar river, at Waterloo, Ia., is $11,000.

The Third ward sewer, East Orange, N. J., on which work was commenced in January, 1895, has been completed.

The Chautauqua plan of disposing of sewerage is favored at Dunkirk, N. Y., as the best and cheapest to operate and construct.

Plans have been ordered prepared for a sewer on La Salle-st. at Wausau, Wis. Plans have also been authorized for E. Warren-st.

The system of sewerage recently completed at Ripon, Wis., by S. J. Perry of Bay City, Mich., has been accepted by the common council. The system is pronounced excellent by the citizens, and the careful manner in which it has been constructed insures it to last indefinitely.

A test was made of the Putnam-ave. main sewer in Plainfield, N. J., recently to find whether or not it was clear of all obstructions and dirt. The test, which was novel and interesting, was made by running a hose into a manhole and filling the main with a heavy volume of water; then a wooden ball six inches in diameter was dropped in, and if carried through with the water to the next manhole it was assured that the pipe was clean.

The work of construction on Lick Branch sewer, at Nashville, Tenn., is progressing rapidly, and it is now thought that it will be completed about Dec. 1, 1895. The work extends from the west line of Front-st. to a point near the east line of Park-st., a distance of 6,280 feet, together with two branches, 650 and 114 feet respectively, with necessary pipe and small brick sewer connections, manhole covers and catch basins. The diameter of the sewer at the lower end is sixteen and a half feet, with thirty-two-inch walls and diameter over all twenty-two feet. About every 1,000 feet the inside diameter changes size and is successively 16 feet, 15½ feet, 15 feet, 14½ feet, 14 feet and in the last twenty feet 11½ feet. The thickness of the walls varies from 32 inches to 20 inches. The Cumberland-st. branch of the sewer is 6½ feet inside diameter, with 12-inch walls, and the west end branch is 9 feet with 12-inch walls. The contract was to have been completed by Jan. 1, 1895, but owing to the great financial stringency of 1893, when the work was begun, this was made impossible. The contract was first awarded to Lesueur & Hutchison for $273,804.16, who some time later sold it or transferred it to a number of gentlemen who organized as the Nashville sewerage company. The work did not progress very satisfactorily and in June, 1894, the company was reorganized. Since then it has been rapidly pushed forward. About 250 men are employed regularly. H. D. Ruhm is the engineer in charge of the work.

CONTEMPLATED WORK.

A sewer is contemplated for the eastern portion of Somerville, N. J.

A complete sewerage system is contemplated at Jackson, Minn.

An extension of drains and sewers is proposed for Waltham, Mass.

Plans have been approved for a sewer in Tiffin-ave. at Sandusky, O.

Sewers will be constructed in Julia-st. and Russell-ave., at Cleveland, O.

Sewers will be constructed in Hudson and Summer-sts. at Trenton, N. J.

Danbury, Conn., will have until May 1, 1897, to change its sewerage system.

A small sewer has been recommended for Smalley-st. at New Britain, Conn.

A local sewer will be constructed in and along Illinois-st., at Evansville, Ind.

An entire system of sewerage has been recommended for Woodstock, N. B., Canada.

A fifteen-inch pipe sewer will be constructed in Olive and East-sts., Bloomington, Ill.

Ordinances have been passed for building sewers in Cherry, Myrtle and Twelfth-sts., Erie, Pa.

The city council of Elwood, Ind., has decided to convert Duck creek into a twelve-foot sewer.

The tax-payers of Hastings, N. Y., have ratified the vote of March 15, to construct sewers in the village.

A twelve-inch pipe sewer will be constructed on W. Twelfth-st. and on Ridge road, Des Moines, Ia.

The plans adopted for a sewer system at Wyoming, O., have been approved by the state board of health.

Resolutions have been adopted at Kansas City, Kas., for building sewers in districts No. 2, 14, 15 and 16.

A cylindrical brick sewer will be constructed in Woodville-st., from Navarre-ave. to Willard-st., at Toledo, O.

A new sewer in Fourth-ave. is contemplated at College Point, L. I., the present one being inadequate to carry off the drainage.

A twelve-inch pipe sewer will be constructed in E. Twenty-first-st., between Fourteenth and Fifteenth-aves., Paterson, N. J.

A petition has been circulated in Reynoldton, Pa., for a sewer in Cherry alley, from Ruth-st. to Pine alley, 500 feet long.

The city council at Duluth, Minn., is considering a sanitary sewer in Grand-ave., east, from Fifty-eighth to Fifty-seventh-sts.

A sewer will be constructed from the corner of Ferris and N. Cherry to the corner of Tompkins and Cherry-sts. at Galesburg, Ill.

Notice of intention has been given at Washington, D. C., for the proposed construction of stoneware sewers in sundry streets and alleys.

A twenty-four-inch terra cotta sewer, 440 feet long, has been ordered constructed in N. Center-st. at a cost not exceeding $500, at Cumberland, Md.

A sewer 250 feet long will be constructed in S. Cedar-st., at Oberlin, O. A sewer is recommended in sewer district No. 13, from the trunk sewer to Oak-st.

Petitions have been received at Lima, O., for about $50,000 worth of sewer bonds. A complete survey will be made of the city and a definite system of sewerage adopted.

Plans are about completed for a sewerage system for Auburndale, a suburb of Toledo, O. An effort will be made to have the storm water sewers constructed this winter.

The South Side park improvement club, San Francisco, Cal., is considering plans for the establishment of a system of sewerage for the district south of the Golden Gate park.

A special election will be held at Stockton, Cal., to decide whether or not bonds shall be issued for the construction of a drainage system. The cost will be about $150,000.

The city engineer at Fredericton, N. B., has been authorized to prepare plans and levels of the town for the purpose of obtaining an estimate of the cost of a drainage system.

Ordinances are in the council at Newark, N. J., providing for a fifteen-inch pipe sewer in High, S. Thirteenth, Livingston, N. Seventh, S. Sixth, Elizabeth, Bruce and Fifteenth-sts.

W. G. Kiersted has submitted plans for a sewerage system for Independence, Mo. He divides the city into five districts, with one main sewer to the Missouri river. Estimated cost, $45,126.

An ordinance has been passed at Decatur, Ill., for a twelve-inch tile sewer, 3,265 feet long, on W. Main-st., with inlets every eighty feet. The Broadway sewer extension has passed first reading.

C. P. Chase of the Iowa engineering and construction company, Clinton, Ia., has been engaged to make the preliminary survey, plans, diagrams and estimates for a general sewer system at Marshfield, Wis.

The residents of the town of Valley, Wash., have made a petition to the board of county commissioners of Stevens county for an order to hold an election for the purpose of forming a drainage district.

The city board of health at Somerset, Ky., has recommended that a sewer pipe be laid from Columbia-st., back of the court house, and extending as far as the county jail, as a step toward a sewerage system for the town.

Resolutions have been adopted at Cleveland, O., for constructing sewers in Pearl, Jay and McCurdy-sts. Sewers are also contemplated in Itasca-st., Lakeview-ave., Cheapside, Kelton, Moulton and Knowlton-sts., and Beulah, East Lake and other streets and avenues.

The West Side sewer commission, Rochester, N. Y., has recommended that plans and estimates be prepared for the extension of the sewer, to accommodate Lincoln park, the territory between West and Chili-aves. and the land donated to the chamber of commerce. The length of the sewer will be increased 3,000 feet by this extension.

CONTRACTS TO BE LET.

Bids will be received until Sept. 10, at Rhinelander, Wis., for constructing a sewer extension. Bond, $500.

Bids will be received until Sept. 10 at Alliance, O., for constructing a system of works for the purification of sewerage.

Sealed proposals will be received until Sept. 3 at Beaver Dam, Wis., for the construction of a pipe sewer in the Fourth ward.

Bids will be opened at Red Wing, Minn., in September for constructing 2,985 feet of sewers in Third-st., and 2,724 feet in Fourth-st.

Sealed proposals will be received at Muncie, Ind., until Sept. 16 for the construction of a sewer to be known as the Eight-st. main sewer. Bond, $50.

Sealed proposals will be received until Sept. 2, at Rock Island, Ill., for the construction of a system of sewers in the Sixth ward. Certified check, $500.

Sealed proposals will be received until Sept. 9 at Wabash, Ind., for the construction of a six-inch vitrified pipe sewer in the first alley north of Hill-st., and an eight-inch sewer in Fisher-st.

Contracts will be let Sept. 10 at St. Louis, Mo., for constructing sewers in Filmore-st., Gravois-ave., Rock Spring sewer, Southern sewer and in sundry streets in sewer districts No. 6, 27, 3, 4, 1 and 2.

Sealed proposals will be received until Sept. 3 at Trenton, N. J., for constructing a sewer in Hewitt-st., from Chestnut to Whittaker-ave. Bond, $500. Also for the construction of a drain in Muirhead-st. Bond, $500.

Sealed proposals will be received at Camden, N. J., until Sept. 6 for building sewers in Senate-st., from Fourth to west of Third; Master-st., from Jefferson northward; Third-st., from Division to Spruce; Pennsylvania-st., from Delaware-ave. to Front-st. Certified check, $20.

Bids will be received until Sept. 4 at Rockville, Conn., for constructing a sewerage system. The materials needed are: One thousand barrels of Portland cement, 2,000 barrels of Rosendale cement, 1,000,000 hard-burned brick and 68,270 feet of eighteen, fifteen, twelve, eight and six-inch sewer pipe.

CONTRACTS AWARDED.

The contract of N. F. Reichert & Co. was accepted for putting a sewer in Park-ave., at Racine, Wis.

Allen & Osgood of Fargo, N. D., secured the contract for building a sewer at Wahpeton for $4,047.

The contract for building sewers in Taunton, Mass., was awarded to Hugh F. McGee for $8,065.

Julius Remus, Ft. Wayne, Ind., secured the contract for building a main sewer in that city at 68 cents per lineal foot.

Hallock Bros. of Wheeling, W. Va., secured the contract for constructing sewers in Mannington, W. Va., for $1,152.

A contract has been awarded J. C. Shriver for the construction of the Green-st. sewer, in Cumberland, Md., for $662.

William Bossert secured the contract for a local sewer in Alabama-st., south of Maryland-st., at $1.45 at Indianapolis, Ind.

Cotton Bros. secured the contract for building a sewer along the east side of Lake Merritt, San Francisco, Cal., for $40,000.

The contract for building the Mamaroneck-ave. trunk sewer, White Plains, N. Y., has been awarded to Alexander Traub.

The contract for constructing a sewer in Chicago-st., De Pere, Wis., was awarded to Jacob VanDommelen of West De Pere for $274.50.

The contract for building a sewer from Second to Third-st., between Walnut and Cedar, Yankton, S. D., was awarded to Palmer & Ingalls.

The contract for laying one mile of sewerage on both sides of Central-ave., Albany, N. Y., was awarded to John Doyle for $10,945.30.

The contract for the Ferber court sewer at Scranton, Pa., has been awarded to Hart & Gibbons of Wilkesbarre, Pa., at $1.38 per lineal foot.

William Heafy was awarded the contract for constructing a storm sewer on Walsworth and Oakland-aves., San Francisco, Cal., for $5,081.

A. W. Bryne, West Medford, Mass., was awarded the contract for constructing section one of the new ward Six sewer at Lawrence, Mass., for $38,330.

The contract for constructing a sewerage system for the Craig Epileptic colony at Mt. Morris, N. Y., was awarded to Barney Smith of Rochester.

Bids were opened recently at Philadelphia, Pa., for the construction of thirteen main sewers at a cost of $250,000 and eighty branch sewers at $60,000.

O. H. Olson & Co. of Stillwater, Minn., was awarded the contracts for the S. Third and Olive-sts. sewers in that city at $4,993 and $2,055 respectively.

A. L. Sager, Saginaw, Mich., recently secured contracts for sewer construction in that city as follows: Sheridan-ave., $399.50; Merrill and Emily-sts., $532.75.

The Camden-st. sewer, from Lawrence to Center-st., 2,500 feet long, at Lawrence, Mass., is being constructed by Joseph Chambers of Lawrence, whose contract price is $1,797.

Bemy & Co. secured the contract for constructing the big sewr, which is the last of the East End drainage scheme, and which has been under course of construction for five years, at Pittsburg, Pa., for $147,602.40.

The contract for constructing a main sewer at Clarion, Pa., has been awarded to the Clarion construction company at $1.34 per lineal foot. The sewer will contain 3,317 lineal feet.

M. Sullivan was awarded the contract for building the William-st. sewer at Elmira, N. Y., at 83 2-5 cents per foot, and Henry Koop the Hathaway-st. sewer at 77 2-5 cents per foot.

E. J. Hanlon secured the contracts at Sioux City, Ia., for the storm sewer at Third and Wall-sts., at $690 and Douglas-st. at $1,525. The Pearl-st. extension was awarded to L. Kettleson at $446.

The contract for building a pipe sewer on Oak-st., Binghampton, N. Y., was awarded to Frank Dennison for $439.85. The contract for a main sewer in Chenaug-st. was awarded to John Smith for $7,999.

Sewer contracts were awarded in Indianapolis, Aug. 27, as follows: White river intercepting sewer, Fulmer, Seibert & Co., $7.29 per lineal foot. Indiana-ave., from First to California-st., Browder & Shover, $2.95.

Contracts for four new sewer extensions were awarded Aug. 7 at New Haven, Conn., as follows: Elm-st., from Howe to Dwight, A. Brazos & Son, $5,365; Sherman-ave., from Eld-st. to Whalley-ave., Darling & Maher; Elm-st., from Kennington to Beers-st., A Brazos & Son, $974.50; West-st., from Columbus-ave. to Congress-ave., A. Brazos & Son, $996.60.

Contracts for sewer construction have been awarded at Troy, N. Y., to John J. Mooney as follows: Spring-ave., 18-inch pipe, 940 feet long, $1.52 per foot for sewers and 40 cents per foot for laterals; Myrtle-ave., 15-inch pipe, 520 feet long, $1.65 per foot and 40 cents per foot for laterals; Myrtle-ave., 12-inch pipe, 520 feet long, $1,37 per foot and 40 cents per foot for laterals.

Bids for building 3,250 feet of brick sewer, four and a half feet in diameter, with a twelve-inch mud-drain of Akron drain pipe, were received Aug. 13 at Medford, Mass., and were as follows: Edward McManus, Waterbury, Conn., $19,100; Trumbull & Ryan, Boston, $19,-048; John Sheehan & Co., Lynn., $17,846; A W. Bryne, West Medford, $13,620; C. R. Gow, Medford, $11,664.

Sewer contracts have been awarded at Dubuque, Ia., as follows: Fifteenth-st., Dubuque construction company, $1,444; Sixteenth-st., Dubuque construction company, $1,501; Schiller-st., John Pickley, $1,630; Fengler-st., D. W. Linehan, $2,004; Middle-ave., D. W. Linehan, $1,226; Rush-st., John Tibey, $2,215; Andoben-ave., Ryan Bros., $1,990; sanitary sewer in Grove Terrace, D. W. Linehan, $616; Hill-st., Dubuque construction company, $192.50.

Sewer contracts have been awarded at Allegheny, Pa., as follows: James-st., J. H. McQuaid, $709; McClure-ave., Eleventh ward, P. O'Donnell, $9,833; McIntyre-ave., W. J. Dunn, $1,277; Grantham-st., Fourth ward, E. F. Hughes, $306; twelve-foot alley, Fourth ward, J. H. McQuaid, $1,-251; Yale-st., Sloan, McElwaine & Ott Bros., $1,276; Royal-st., Sloan, McElwaine & Ott Bros., $2,566.50; Nixon-st., J. H.

McQuaid, $711; Spring alley, Second ward, J. H. McQuaid, $422; first alley, Third ward, J. H. McQuaid, $332.

Seven contracts have been awarded at Philadelphia, Pa., as follows: Allegheny-ave., J. Sellers Kite & Co., $30,000; American-st., R. P. Bennis, $85,000; Chew-st., E. Bennis, $10,500; George Run extension, J. Sellers Kite & Co., $50,000; Fifty-sixth-st., K. & D. Dooley, $5,000; Fifty-seventh-st., J. Sellers Kite & Co., $16,000; Lefevre-st., J. H. Hathaway & Co., $9,500; Mill-st., John Benhage, $19,000; Milnor-st., James Sullivan, $18,500; Ontario-st., M. McManus, $15,000; Twentieth-st., John E. Wynkoop, $18,000; Jasper-st., H. G. Eyre, $12,000; Woodland-ave., J. Sellers Kite & Co., $12,000.

WATER-WORKS.

A committee is investigating the best prospects for a water supply for Waterbury, Conn.

Surveys and estimates are being made for a water works system to unite Loraine and Elyria, O.

Michigan City, Ind., will vote in October on issuing $39,000 in bonds for water works improvement.

The question of issuing $65,000 worth of additional water works bonds was defeated at Hamilton, O., Aug. 3.

Plans have been submitted at Cincinnati, O., for building two tanks at Mt. Auburn, instead of one. The estimated cost is $100,000.

O. C. Drew has been appointed to succeed Maj. George A. Race as a member of the committee to confer with the water works company at Houston, Tex., in the city's proposed purchase of the plant.

A resolution was adopted Aug. 13, at Danbury, Conn., authorizing the superintendent of water works to confer with a competent engineer regarding the proposed plan to increase the water supply.

The trustees of Port Richmond, N. Y., will call a special election to decide whether the village shall build its own water works, unless the Staten Island water supply company will enter into a contract to supply private consumers at reduced rates.

Under instructions from Director Thompson and Chief Engineer Trautwine of the bureau of water, Philadelphia, Pa., the preparation of plans and specifications for repairs to the Queen Lane reservoir is being hastened, with a view to completing the work at the earliest possible time.

A special election will be held Sept. 24 on the water works question at Duluth, Minn. Four propositions will be presented to the voters: First, to issue bonds to the amount of $1,856,000 to purchase or erect a water plant; second, to purchase te plant of the present water company; third, to erect an independent plant; fourth, to issue bonds for the extension of the present company's system in the event that the second proposition is adopted.

Prof. Barrett, city electrician at Chicago, Ill., has a plan for increasing the water supply, which is to place auxiliary pumps of sufficient capacity at various points along the larger mains, thus increasing the pressure. The pumps are to be operated by means of electric motors, supplied with a current from the city electric light plant, so that the cost will be reduced to a minimum. By adopting this plan it is thought a much better water supply can be maintained and the complaint from residents throughout the city will cease.

The city council at Corry, Pa., was perpetually enjoined from carrying out the terms of a contract with Joseph L. Witmer of Buffalo for water works by a decision of Judge Gunnison Aug. 13. The contract specified a payment of $6,000 a year for twenty years, and a deposit of $4,000 annually for interest, to be turned over at the end of twenty-four years to Mr. Witmer. The ruling of Judge Gunnison is that the contract carried out what would be a debt, and as the city of Corry is already involved far beyond its legal indebtedness, the contract could not be consummated.

CONTEMPLATED WORK.

Water works are being agitated for Elkader, Ia.

The water works question is being agitated at Tripoli, Ia.

Water works are contemplated at College Hill, O., and Ft. Atkinson, Wis.

Bonds have been voted for water works at Escanaba, Mich., and Platteville, Wis.

The town board, Reading, Mich., has been presented with a petition for water works.

The residents of Honey Brook, Pa., are agitating the establishment of a water works plant.

An ordinance has been passed for a six-inch water main on Ohio and Prairie-sts., Bloomington, Ill.

Water works have been voted for as follows: Farley, Ia.; Calmarics, It.; Clayton, Ia.; Grant City, Ia.

A new water system, with a supply from Salmon Falls river, has been voted for at Somersworth, N. H.

The Iowa engineering company, Clinton, Ia., is preparing plans for a water works system at Oxford, Ia.

The residents of Govanstown, Md., are considering the question of forming a company to supply the town with water.

An ordinance authorizing the expenditure of $2,200 for the extension of water mains was passed at Jacksonville, Fla., Aug. 7.

H. Ward, Binghampton, N. Y., writes that an election will be held on the question of bonding for the construction of a reservoir.

CONTRACTS TO BE LET.

Bids are invited until Sept. 3 at Warren, Ill., for constructing a water works system.

Bids will be received at Armstrong, Ia., until Sept. 17 for constructing a water works system.

Sealed proposals will be received until Sept. 2 for constructing water works at Millersburg, O.

Bids will be received until Sept. 4 at Brownton, Minn., for constructing a water works system. Check, $300.

Bids are invited until Sept. 16 at Youngstown, O., for two pumping engines of 5,000,000 gallons capacity daily.

Sealed proposals will be received until Sept. 5 at Carrollton, O., for constructing a system of water works.

Sealed proposals will be received until Sept. 10 for additional pipe conduit at Brooklyn, N. Y. Certified check, $1,500.

Sealed proposals will be received until Sept. 30 for furnishing a pure water supply to Camden, N. J. Certified check, $1,000.

Sealed proposals will be received at Lakewood, O., until Sept. 11 for laying a twelve-inch water main in Detroit-st. Bond, $3,000.

Sealed proposals will be received until Sept. 5 at Lagrange Park, Ill., for furnishing and laying 15,000 feet of cast iron pipe and 400 house service connections.

Sealed proposals will be received at Rushville, Ind., until Sept. 17 for furnishing material and constructing a water works plant on a twenty-year franchise plan. Certified check, $1,000.

Sealed proposals will be received until Sept. 10 at Grand Junction, Col., for the construction of a water works system. The time of receiving the bids was deferred from Aug. 20 to Sept. 10.

CONTRACTS AWARDED.

A franchise has been granted to George C. Morgan of Chicago for the water works system at Indianola, Ia.

Fairbanks, Morse & Co. of St. Paul will construct the water works system for Windom, Minn., for $25,000.

The contract for the Jerome Park reservoir, New York City, was awarded to John B. McDonald of Baltimore for $5,472,080.

E. S. Whitney of Allentown, Pa., secured the contract for constructing water works at Sellersville, Pa., for $23,069.10.

Chandley Bros. & Co. of Beaver Falls, Pa., were awarded the contract for building the new water works system at Warsaw, N. Y.

The contract for constructing a system of water works for Belmont, Wis., was awarded to the Dubuque construction company for $2,700.

The contract for putting in a system of water works at Elizabethtown, Ky., was awarded to Herbert & Lapyre of Chattanooga, Tenn., for $14,741.15.

The Denver vitrified pipe and clay company, Denver, Col., was awarded the contract for putting in a mile of vitrified pipe in the water works line at New Castle, Col.

Louis Mayer, Lancaster, O., presented the lowest bid for constructing a water works system at Logan, O., Aug. 1. The bid was $47,000—$12,000 more than the appropriation.

The Jersey City water company was awarded the contract for a new water supply for Jersey City, N. J., Aug. 13. It is thought the contract will not be concurred in, however.

Plans are being prepared for a system of water works at Rossland, Wash., which will be put in by Spokane and Rossland capitalists. Peter Costello of Spokane will construct the system.

BRIDGES.

A bridge is contemplated across the creek at Fifth-st., Ouray, Col.

A new bridge will be constructed at Phillips creek, west of Ionia, Mich.

A new bridge is being proposed at Duncan's Mills, Cal., across Austin creek.

The bridges spanning the Monongahela river at Pittsburg, Pa., will be made free to the public.

Belfast, Me., voted in favor of an iron bridge across the harbor at a cost not exceeding $85,000.

A new bridge has been ordered constructed over the Cohausey at Broad-st., Bridgeton, N. J.

E. S. Beatty of Blair, Neb., secured the contract for building several bridges in Madison county.

The construction of a bridge over a culvert at Milburn-ave. has been requested at Newark, N. J.

A company has been organized to build a foot bridge over the Kanawha river at Parkersburg, W. Va.

Work will begin Dec. 15 on the steel viaduct that is to replace the superstructure of the Rock Island bridge.

The bids received Aug. 12 for an iron bridge over Apple river, at Apple River, Ill., were rejected as being too high.

The LaFayette bridge company was awarded the contract for the Sugar creek bridge near Frankfort, Ind., for $5,175.

An adverse report was filed by the board of viewers on the proposed bridge across the Ohio river at Semckley, Pa.

Sealed proposals will be received until Sept. 23, at Wabash, Ind., for a bridge across the Wabash river at Wabash-st.

The city council of Plymouth, Wis., awarded the contract for building a stone arch bridge to H. Schwalenburg for $2,500.

The King bridge company of Cleveland, O., secured the contract for building a new bridge over Newton creek, Brooklyn, N. Y., for $418,000.

The King bridge company of Des Moines, Ia., secured the contract for a bridge over the Des Moines river, near Boone, Ia., for $16,000.

A petition has been circulated at Davisville, Cal., asking for a sand bridge across Putak creek, near the site of the old Stephenson bridge.

Bids will be received until Sept. 4, at Taunton, Mich., for building a girder bridge and stone abutments over Three Mile river, at Winthrop-st.

The contract for building the Panther Hollow bridge, in Schenley park, Pittsburg, Pa., was awarded to the Schultz bridge company for $165,700.

The commissioners of highways, Freeport, Ill., have decided upon a bridge 160 feet long, with tubular abutments, across the Pecatonica, at Ascherville.

The F. C. Austin manufacturing company, Chicago, Ill., was awarded the contract for two iron bridges over the Sevenmile branch, near Sterling, Ill.

Bids will be received until Sept. 2, at Zanesville, O., for the superstructure of a steel draw span, at the west end of the county bridge at Taylorsville. Bidders must furnish their own plans and specifications. Certified check, $200.

Sealed proposals will be received until Sept. 7, at Cincinnati, O., for a wrought iron truss bridge over Schnapp creek on Gaines road, Colerain township.

The Wrought iron bridge company of Canton, O., was awarded the contract for the superstructure of the Rensselaer-st. viaduct, at Troy, N. Y., for $14,920.

A bridge will be built across the Ohio river to connect Bellaire, O., and Benwood, W. Va. Bellaire, Pittsburg and Wheeling capitalists are interested.

Sealed proposals will be received until Sept. 3, at Rockford, Ill., for constructing a platt girder bridge on Keith's creek at Eighth-ave. Certified check, $100.

The plans for the proposed new bridge over the Monongahela at Monongahela City, Pa., will be placed on exhibition Sept. 2, after which objection may be filed.

The plans for the new bridge to cross Dugway Brook, on the Euclid-ave. side of Lake View cemetery, Cleveland, O., have been completed. The estimated cost is $5,000.

The Brackett bridge company was awarded the contract for the superstructure to the new bridge across Mill creek, in Spring Grove-ave., for $29,588, at Cincinnati, O.

Sealed bids will be received until Sept. 4, at Toledo, Ia., for the erection of a one-span iron bridge, 125 feet long, across Otter creek, about one-fourth of a mile from Chelsea.

A new bridge is being urged as a necessity across the estuary between Oakland and Alameda, Cal., to take the place of the two old wooden bridges now in use at Alice and Webster-sts.

Plans are being prepared for a new bridge at Huron-st., Milwaukee, Wis. This bridge is considered more necessary than the proposed bridge from Greenfield-ave. to Jones island.

The contract for an iron bridge across Big creek, at the William Dempster ford in Wabash township, near Marshall, Ill., has been awarded to the Pennsylvania bridge company for $2,800.

The commissioners have adopted plan "a" of the King bridge company for the high level bridge at Ashtabula, O., at a cost of $47,000. The bridge will be 920 feet long and 114 feet from the bed rock.

The contract for building a Platt truss bridge over the Connecticut river at White river junction, Lebanon, N. H., has been awarded to the Berlin iron bridge company of East Berlin, Conn., for $24,547.50.

Sealed proposals will be received until Sept. 2 at Zanesville, O., for the superstructure of a steel draw span at the west end of the county bridge at Gaysport. Strain diagrams and certified check for $200 must accompany each bid.

The county commissioners of Berks county, Pennsylvania, have been presented with a petition by the property-owners along the Schuylkill, asking them to erect a bridge across that river about two miles south of the present structure at Hamburg.

An ordinance is being prepared for the construction of a viaduct over the Santa Fe tracks at Allen-ave. and Twenty-third-st., Kansas City, Mo. The estimated cost is $40,000, one-half of which will be paid by the city and one-half by the Santa Fe and Council Bluffs roads.

Osceola, Wis., will vote on a proposition made by L. H. Johnson of the Wisconsin bridge and iron company, who offers to build a combination span bridge over the St. Croix river, 265 feet long, with a fixed span of 150 feet, the rest to be of timber, and the total length to be 2,200 feet, for $13,000.

A proposition has been made to the council at St. Croix Falls, Wis., by L. H. Johnson, representing the Wisconsin bridge and iron company, to build a bridge. The village's share of the cost would be about $3,500 and the rest would be secured from the Duluth railroad company. Action has not yet been taken.

The property owners on S. Ninth-st. and in Clifton Heights, Des Moines, Ia., have, since the paving of Ninth-st. has been completed, begun urging again the building of a viaduct across the railroad tracks at Ninth-st. Those interested think the railroad commissioners will be favorably disposed toward the improvement.

Plans submitted recently for the proposed new iron bridge across Belfast Harbor, Belfast, Me., show it to be about 1,300 feet in length, of which 1,190 feet would be of iron, the bridge to be in spans of 130 feet each, resting on granite piers; a roadway twenty-eight feet wide with a six-foot walk outside. The estimated cost of the bridge is $85,000.

The Illinois river bridge company, which was given a franchise by congress to construct a bridge over the Illinois river at Hennepin, Ill., has asked the village for a bonus of $15,000 to be paid on the condition that the company construct a bridge and a railroad to run from Bureau to Hennepin. The village board has authorized the issue of $2,000 in bonds for this purpose. The boards of supervisors of Putnam and Bureau counties have also been asked for the right-of-way in the counties for the enterprise. Hennepin, the county seat of Putnam county, has neither railroad, telegraph or telephone lines.

PARKS.

The board of trade at Visalia, Cal., will establish a city park.

An appropriation of $3,000 has been made at Elgin, Ill., for the improvement of Gifford's park.

The Highland Springs company of Hudson, Summit county, O., has been incorporated to establish a pleasure park.

A modern athletic and recreation park will be established at North Oakland, Cal. Local capital will be invested.

A block of ground known as "court square," has been purchased by Glencoe, Minn., and will be converted into a village park.

A petition will be presented to the city council of Baltimore, Md., when it meets in September, asking that the $280,000 remaining after the purchase of Clifton be expended in parking a triangle-shaped piece of ground bounded by Eutaw and St. Mary's-sts. and David Hill-ave.

A plan is being considered at Galesburg, Ill., for the permanent improvement of Central park. The plans show a handsome fountain in the center with a stone pavement about it; a square in the center formed by the sidewalks will be paved with brick except where the stone surrounds the fountain; the walks will be increased from six feet to ten feet, and the outside of the square between the walks and the iron railing will contain a lawn and flower beds.

STREET CLEANING.

An appropriation of $35,000 for street cleaning is favored by the council's committee at Cleveland, O. This would be an increase of $5,000 over last year.

St. Paul, Minn., is interested in methods of cleaning asphalt pavement. City Engineer Rundlett is believed to be inclined to sweeping by hand, while Health Commissioner Stone has a decided preference for washing the pavements according to the methods in vogue in Paris.

Contracts for sweeping and cleaning streets were awarded Aug. 17 at Indianapolis, the bids for each 10,000 square feet until Nov. 4, 1895. The Indianapolis street cleaning company secured the contract for a large number of streets at prices ranging from 38 to 55 cents. Fuehring Bros. also received contracts for a number of streets at prices ranging from 39 to 52 cents.

The city council at Hamilton, Ont., has refused to provide for the cleaning of the asphalt pavement on the local improvement system, and the men employed in cleaning the streets have been discharged. The ward appropriation system inaugurated this year is the cause of the trouble. The cost of cleaning amounts to about 80 per cent. a week, of which two-thirds is chargeable to the Second and Fifth wards.

STREET LIGHTING.

An electric light plant will be established at Versailles, Ky.

A new electric light plant is to be established in Rahway, N. J.

Bids will probably be asked soon at Owensboro, Ky., for an electric light plant.

The citizens of Cassopolis, Mich., are agitating the question of putting in an electric lighting plant.

The town trustees of Batesville, Ind., have voted in favor of lighting the streets with electricity.

Some of the substantial business men of Demopolis, Ala., are trying to organize an electric light company to erect a plant during the next year.

Sealed proposals will be received until Sept. 4, at Blackwood, N. J., for the installation of an electric light plant for the asylum and alms house.

MUNICIPAL BONDS.

Fern Bank, O., asks bids until Sept. 13 for $645.39 5 per cent. sidewalk bonds.

Bids are asked until Sept. 2 at Carrollton, O., for $5,000 worth of water works bonds.

Bids are invited at Weston, O., until Sept. 9 for $6,000 6 per cent. street improvement bonds.

Bids are invited until Sept. 2, at Mansfield, O., for $24,000 6 per cent. improvement bonds. Check, $500.

Bids will be received until Sept. 9, at Defiance, O., for $20,000 5 per cent. improvement bonds. Check, $1,000.

Bids will be received by William H. Krapp, clerk at Evanston, until Sept. 12 for $3,516.10, 6 per cent. sewer bonds.

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